

20-251E

September 12, 2003

Dr. William Pitts
National Institute of Standards & Technology
100 Bureau Drive-Mail Stop 8662
Gaithersburg, MD 20899-3571

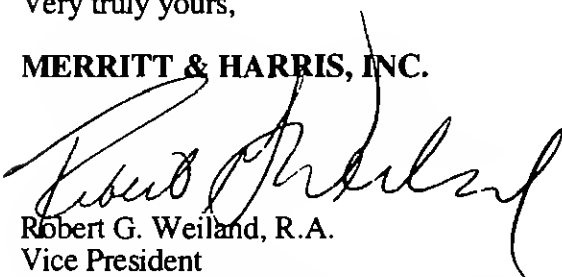
Re: **World Trade Center**
New York, New York

Dear Dr. Pitts:

Transmitted herewith is a complete set of the Merritt & Harris, Inc. photographs included in our Report 20-251E as requested by Mr. Harold Nelson. Permission for this release was granted by Mr. Frank Lombardi of the Port Authority of New York and New Jersey.

Very truly yours,

MERRITT & HARRIS, INC.

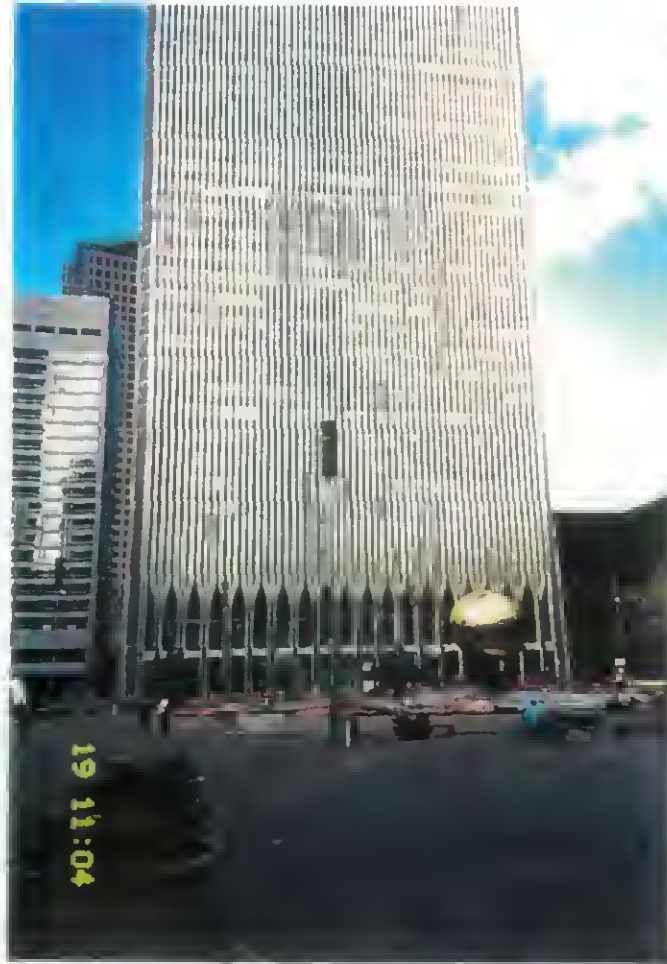


Robert G. Weiland, R.A.
Vice President

cc: Port Authority of New York and New Jersey
Attn: Saroj Bhol with Photographs
Attn: Frank Lombardi - Transmittal Only

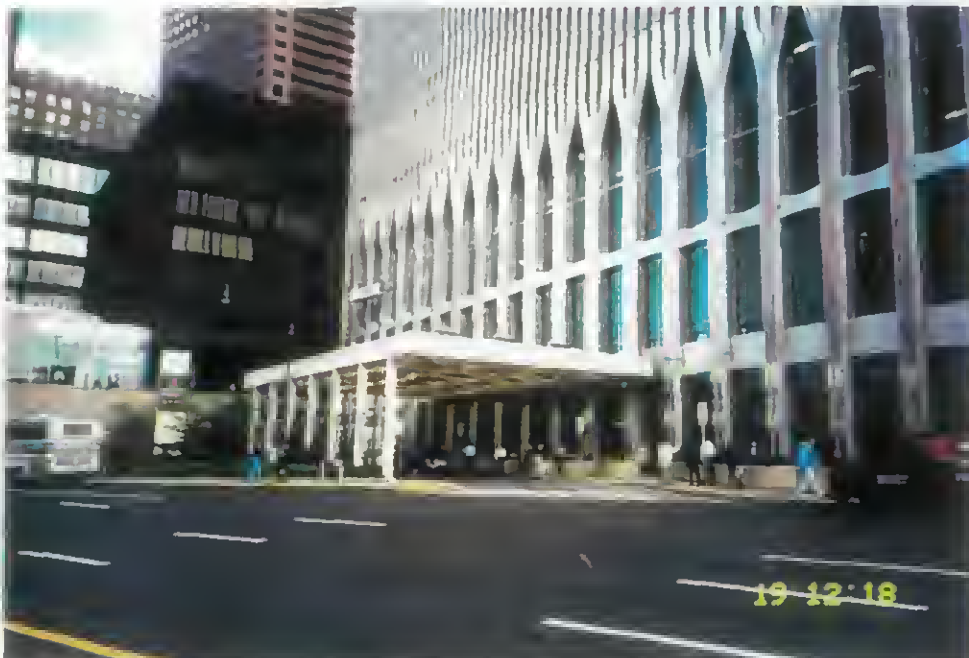
One World Trade Center

World Trade Center
New York, New York



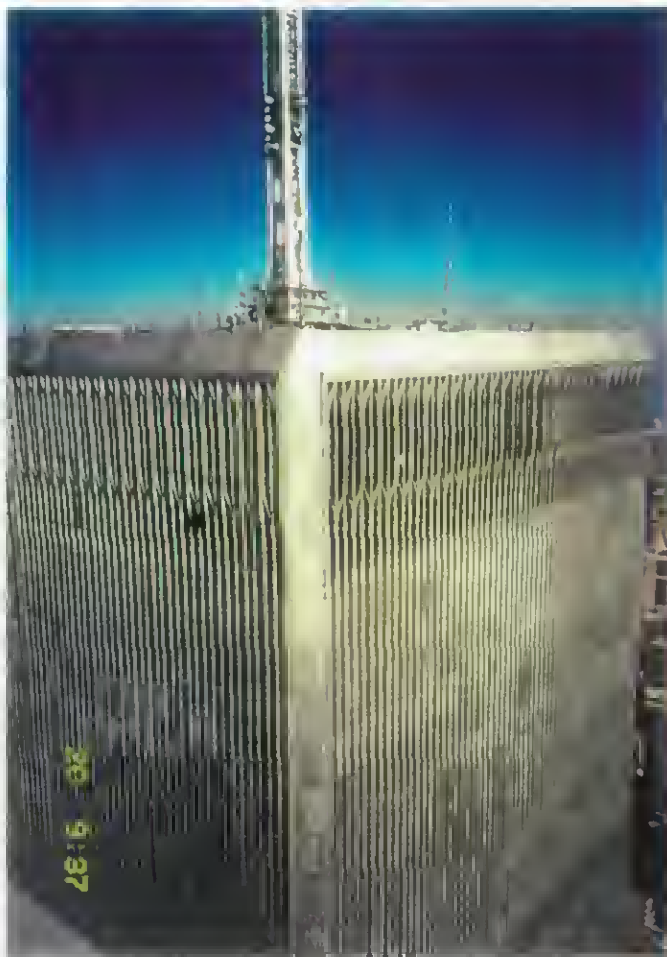
Photograph 1

Front plaza level
entrance (east)



Photograph 2

West Street Entrance
to Lobby



Photograph 3

Rooftop and antenna



Photograph 4

Antenna

Photograph 5

Window washing rig



Photograph 6

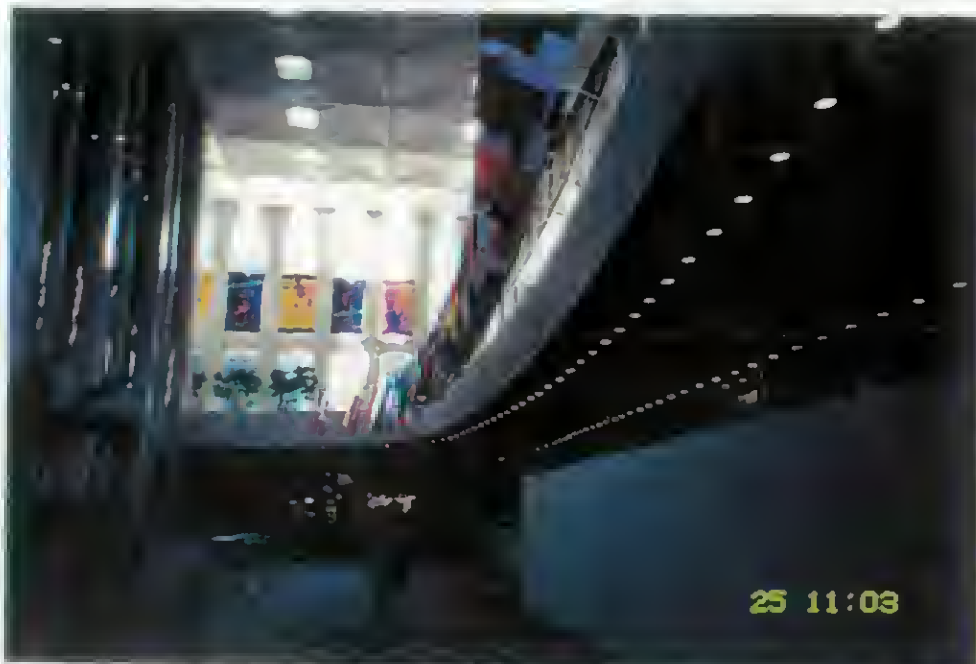
Typical setback at
MER levels

One World Trade Center

World Trade Center
New York, New York

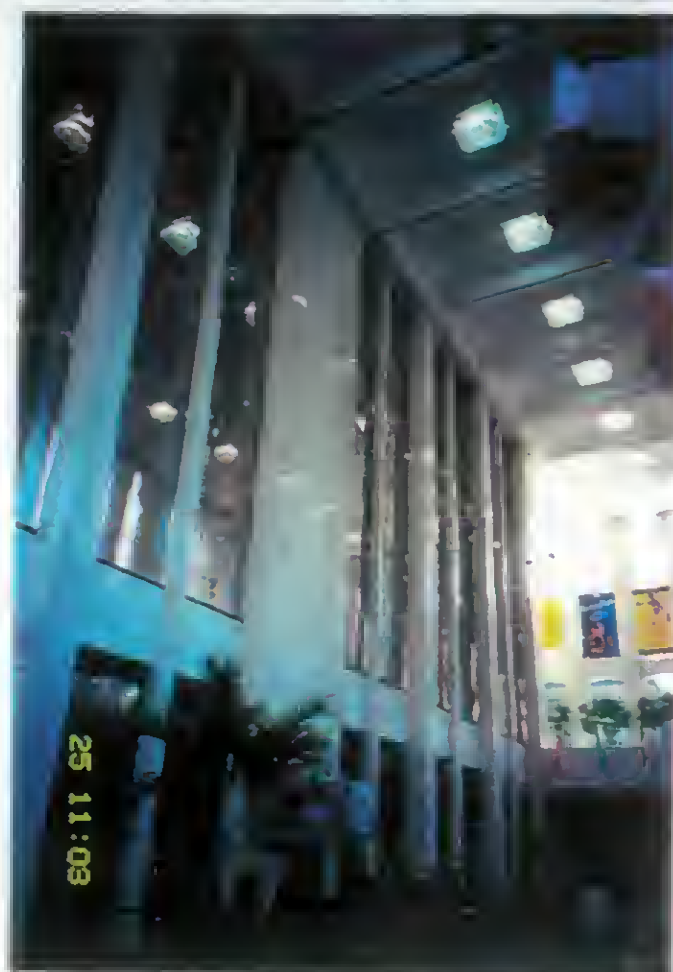
Photograph 7

Lobby with plaza
level mezzanine
above



Photograph 8

Lobby and elevator
banks

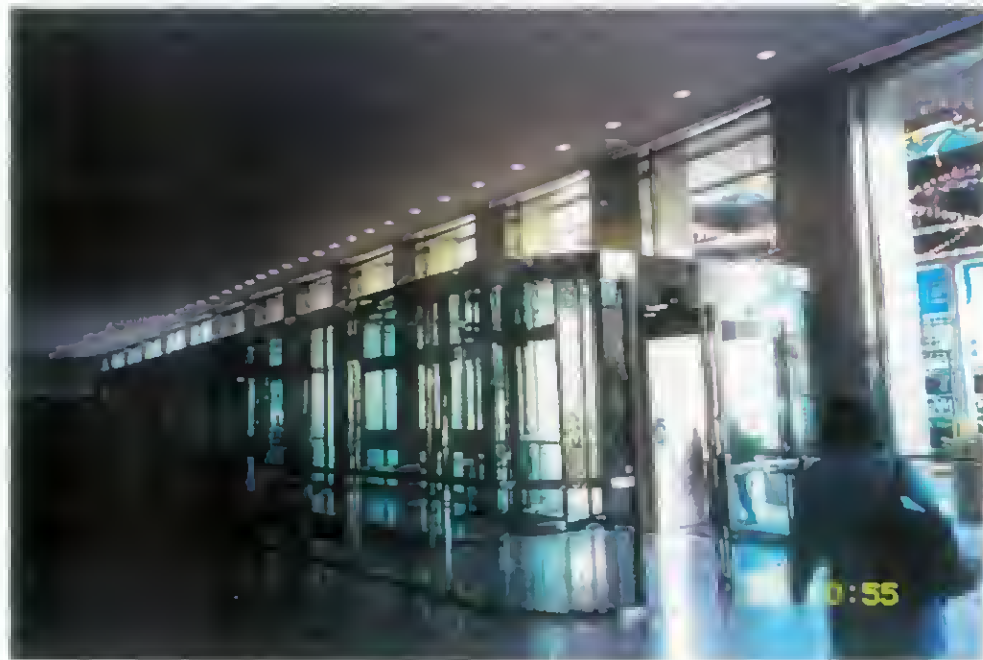




Photograph 9

Lobby entrance
from mall, and
escalators to
mezzanine

X



Photograph 10

Lobby entrance and
vestibule on West
Street



Photograph 11

**Lobby suspended
plaster ceiling panels**

X

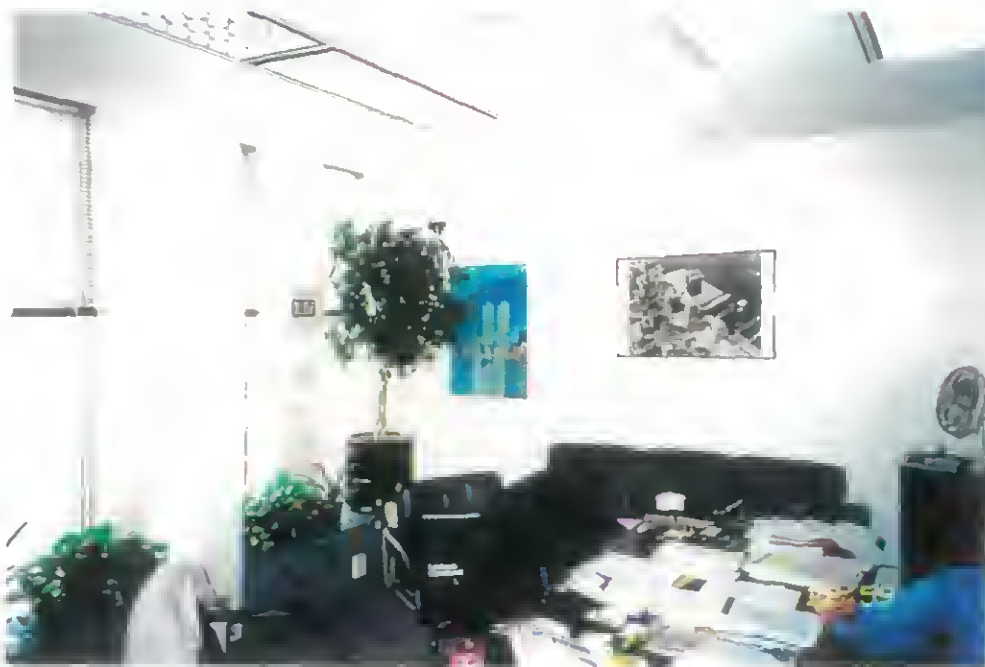


Photograph 12

**Typical multi-
tenanted floor
corridor**

Photograph 13

Typical multi-
tenanted floor
elevator vestibule



Photograph 14

Typical office

One World Trade Center

World Trade Center
New York, New York



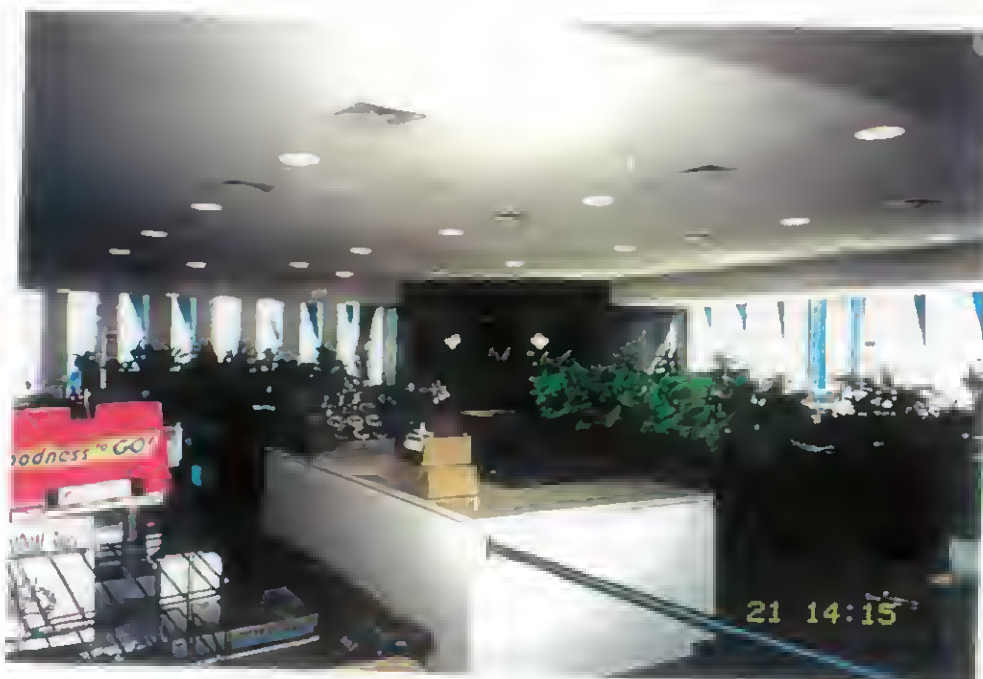
Photograph 15

Vacant space



Photograph 16

**Windows on the
World rest room**



Photograph 17

Port Authority
Cafeteria on 43rd
floor



Photograph 18

Port Authority
Cafeteria on 43rd
floor

One World Trade Center

World Trade Center
New York, New York



Photograph 19

Upgraded toilet
room



Photograph 20

Elevator vestibule
Level B3 for garage



Photograph 21

Bent stair nosing on
wide stairs.



Photograph 22

Viscoelastic damper
at each floor joist.



Photograph M1

Condenser water
system #2 pump



Photograph 2

Condenser water
system #2 heat
exchangers



Photograph M3

New condenser
water system #2
pump and plate
and frame heat
exchanger



Photograph M4

New freeze
protection
system chilled
water pumps



Photograph M5

480 volt and 208
volt electric bus
duct risers
located in a
typical electric
closet



Photograph M6

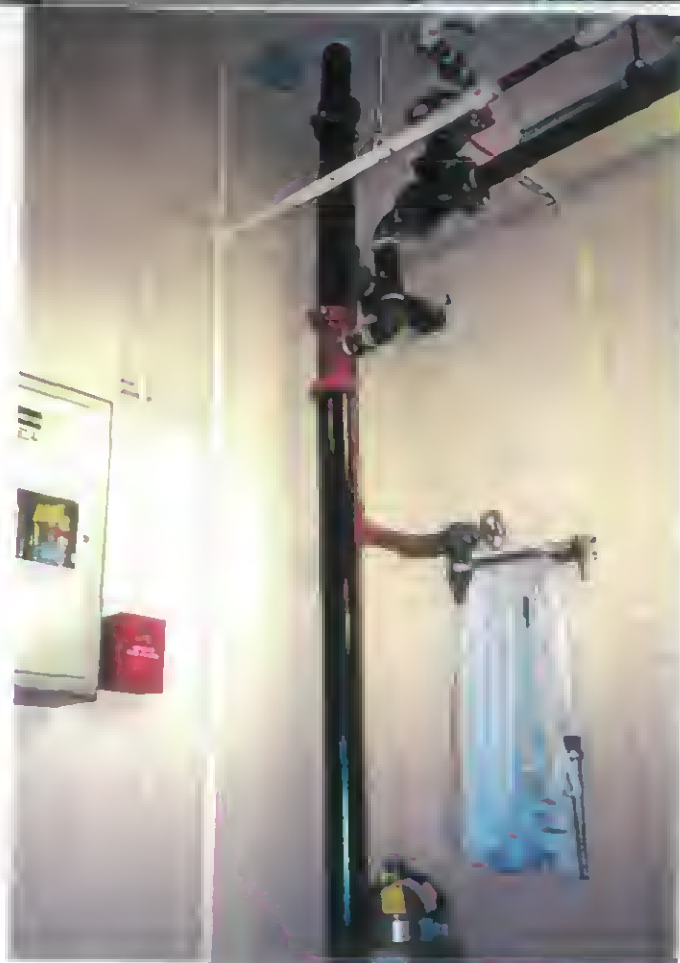
5,000 gal.
standpipe fire
reserve tank



Photograph M7

Typical floor
sprinkler control
valve room with
sprinkler supply
line and flow and
tamper switches

X



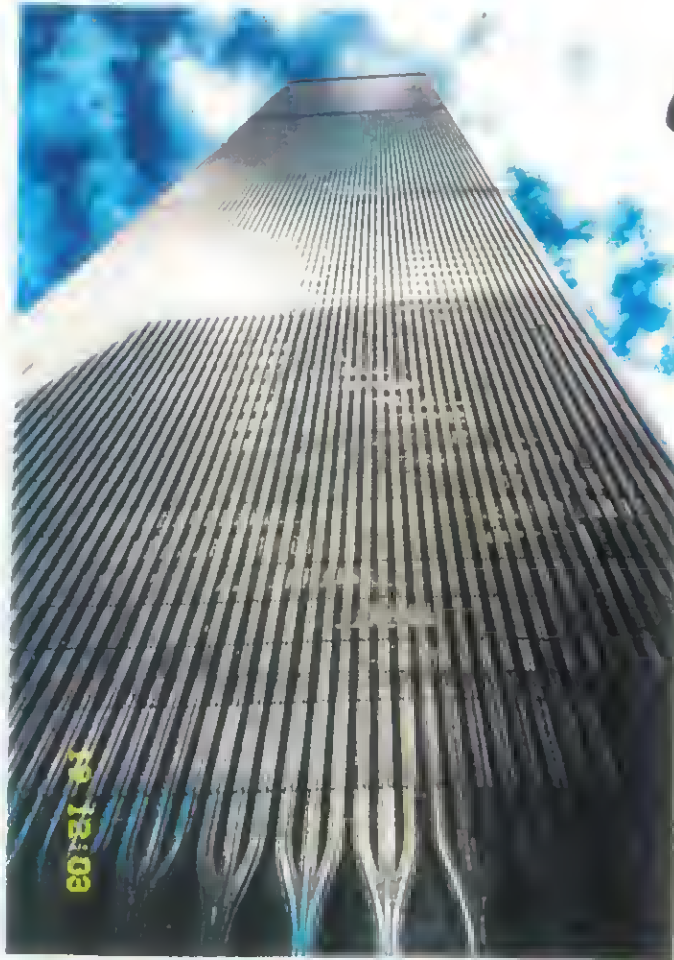
Photograph M8

Standpipe riser
with a fire hose
rack, and fire
extinguisher
cabinet located
in the stairs



PhotographM9

Typical office floor corridor with an exit sign, manual pull station, fire warden station, and audio/visual alarm



Photograph 1

Liberty Street
elevation



Photograph 2

Liberty Street
entrance to Lobby

Two World Trade Center

World Trade Center
New York, New York



Photograph 3

Plaza elevation,
Marriott hotel in
background



Photograph 4

Rooftop observation
deck, window
washing rig



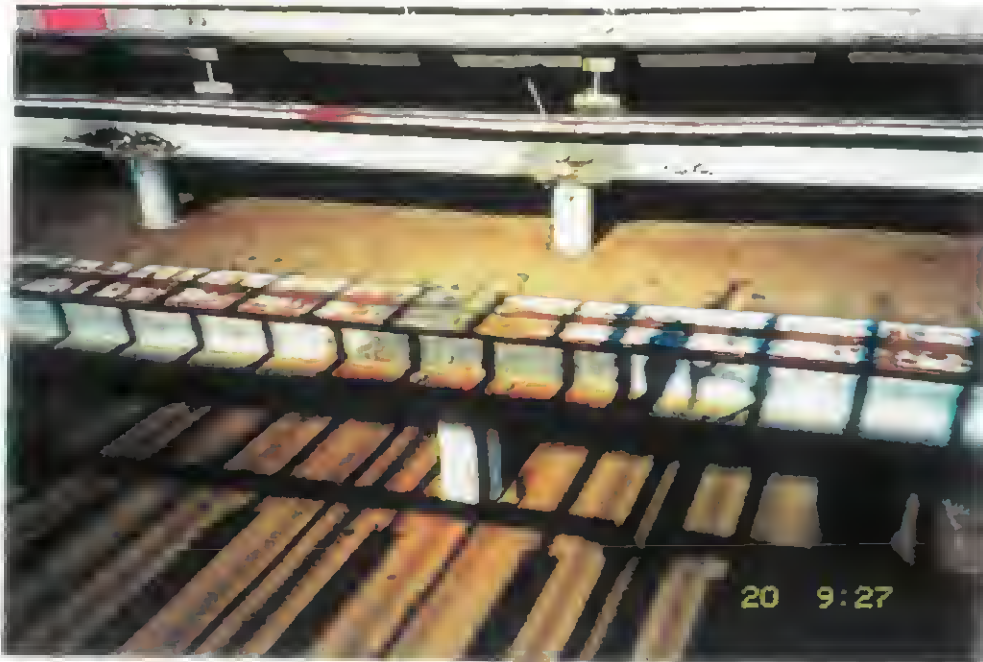
Photograph 5

Entrance to rooftop
observation deck;
note concrete
covered roof



Photograph 6

Helicopter pad



Photograph 7

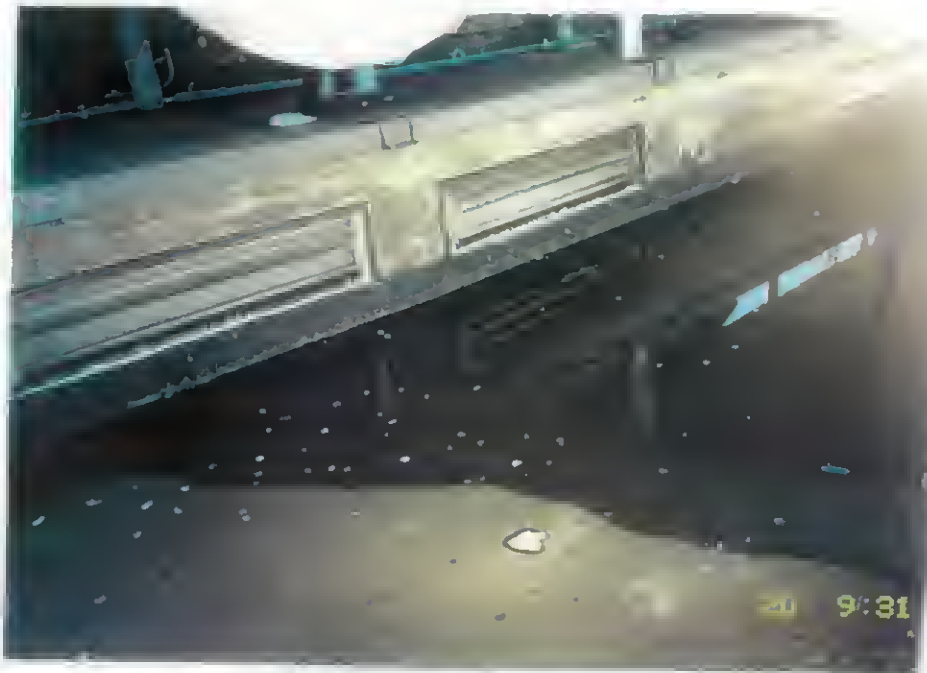
Rusted window
washing rig rails



Photograph 8

Rusting purlins for
exposed facade at
110-story and at
roof

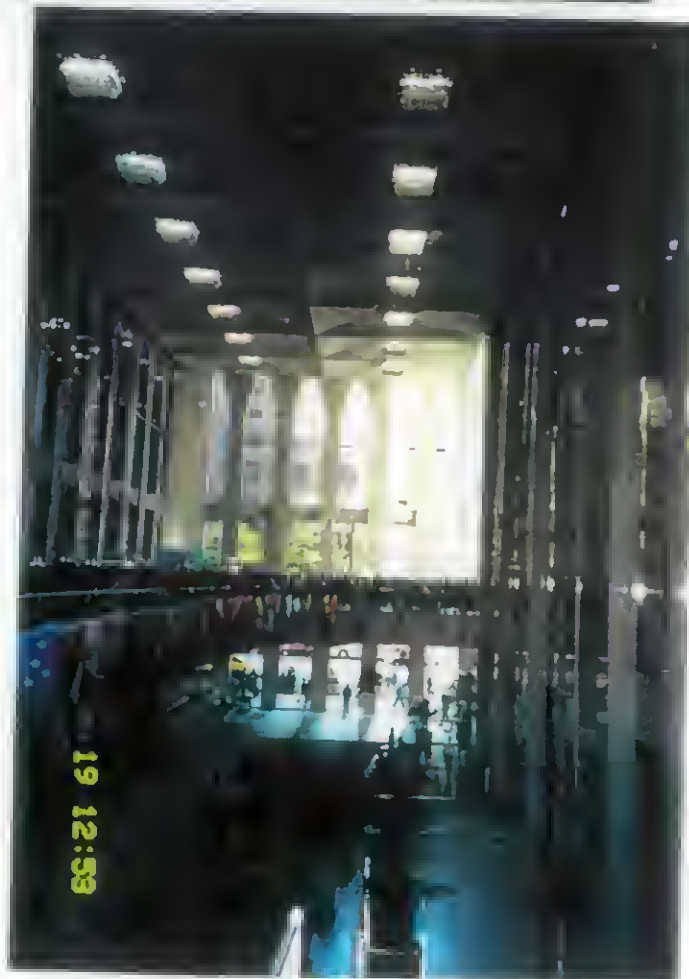
Two World Trade Center



World Trade Center
New York, New York

Photograph 9

Puddles at main roof
indicate poor
drainage

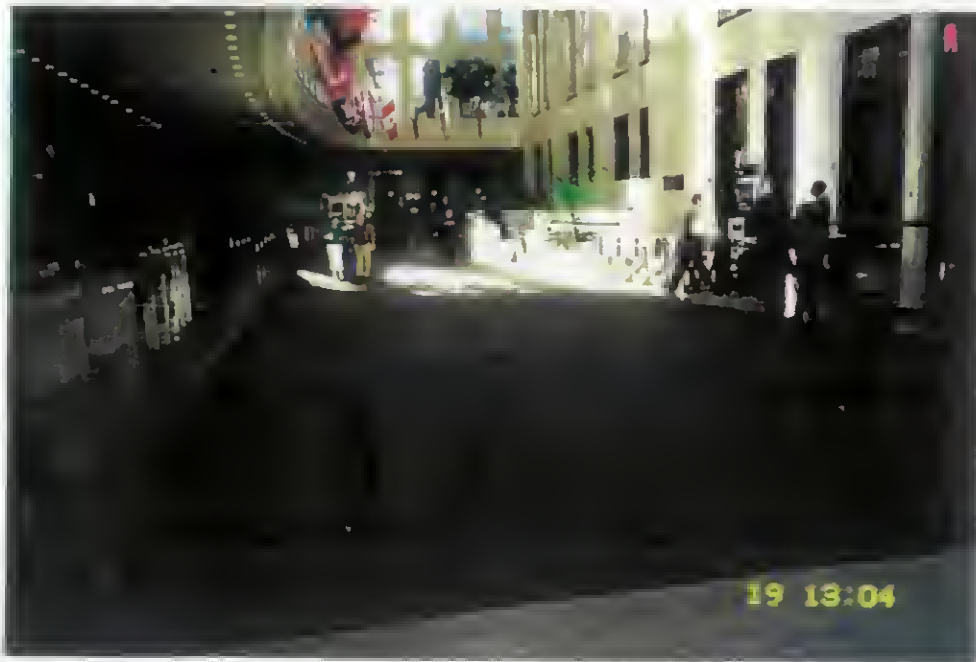


Photograph 10

Lobby and
mezzanine

Two World Trade Center

World Trade Center
New York, New York



Photograph 11

Lobby - visitors desk
on left, security gates
to elevators on right

X



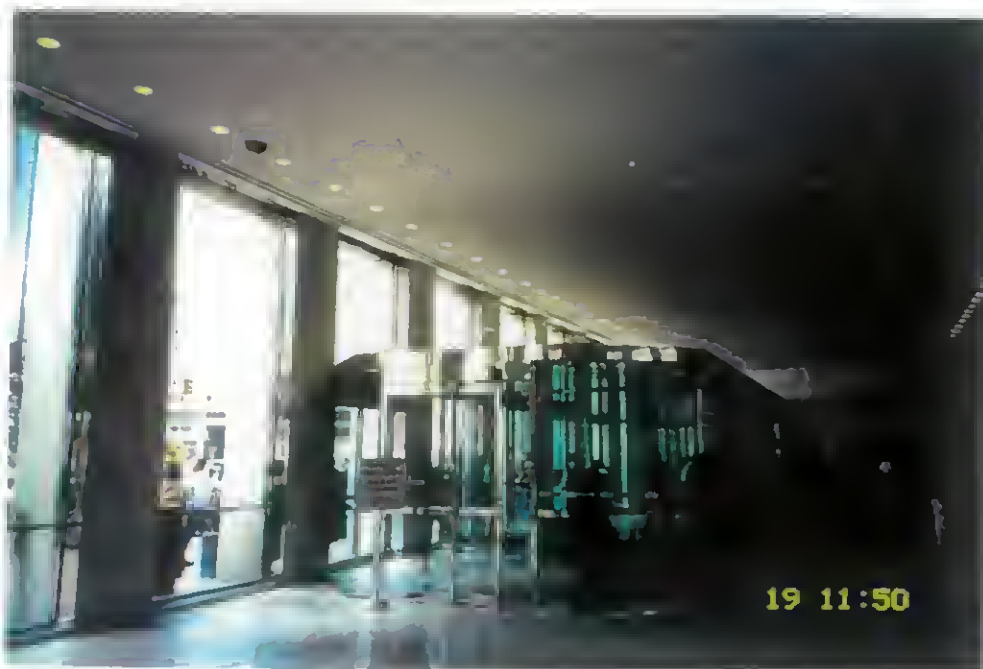
Photograph 12

Lobby, secured
entrance to elevators
to garage on right



Photograph 13

Vacated desks in
lobby



Photograph 14

Lobby and vestibule
entrance from
Liberty Street

Two World Trade Center

World Trade Center
New York, New York



Photograph 15

ADA accessible
entrance from mall



Photograph 16

Typical sky lobby



Photograph 17

Typical multi-tenant
elevator vestibule

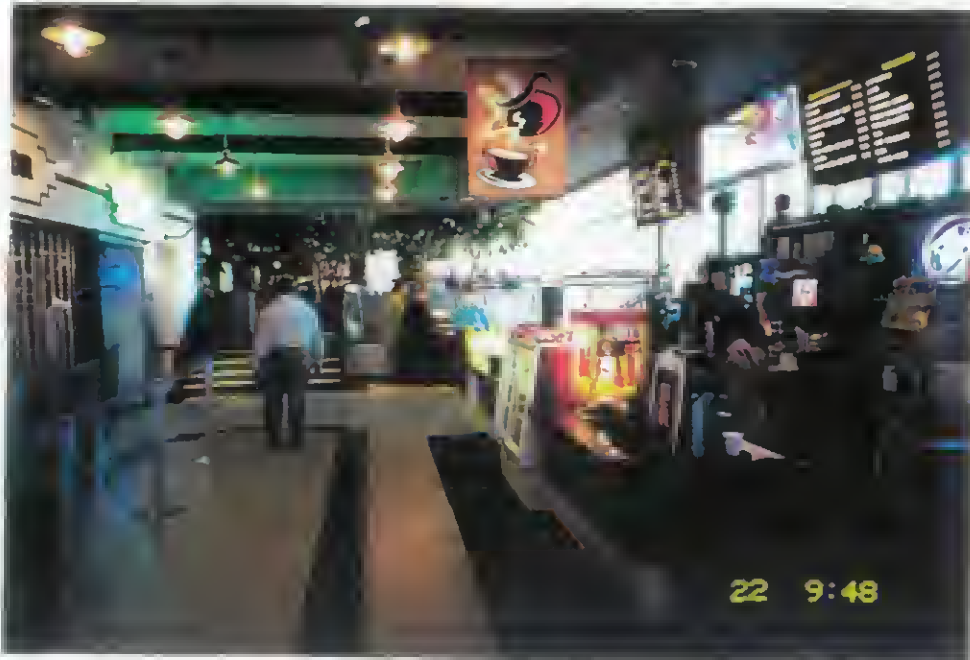


Photograph 18

Typical toilet room
with original finishes

Two World Trade Center

World Trade Center
New York, New York



Photograph 19

Observation deck
cafeteria



Photograph 20

Observation deck
eating area



Photograph 21

Typical floor office
interior

X



Photograph 22

Viscoelastic damper
at each floor joist



Photograph 23

Typical floor
framing system after
fireproofing
respraying



Photograph 24

Upgraded elevator
lobby, by tenant



Photograph M1

Typical 7th floor
mechanical room air
handler and
abandoned freeze
protection pump
system



Photograph M2

New air handling
unit for the
electrical
substation on the
74th floor



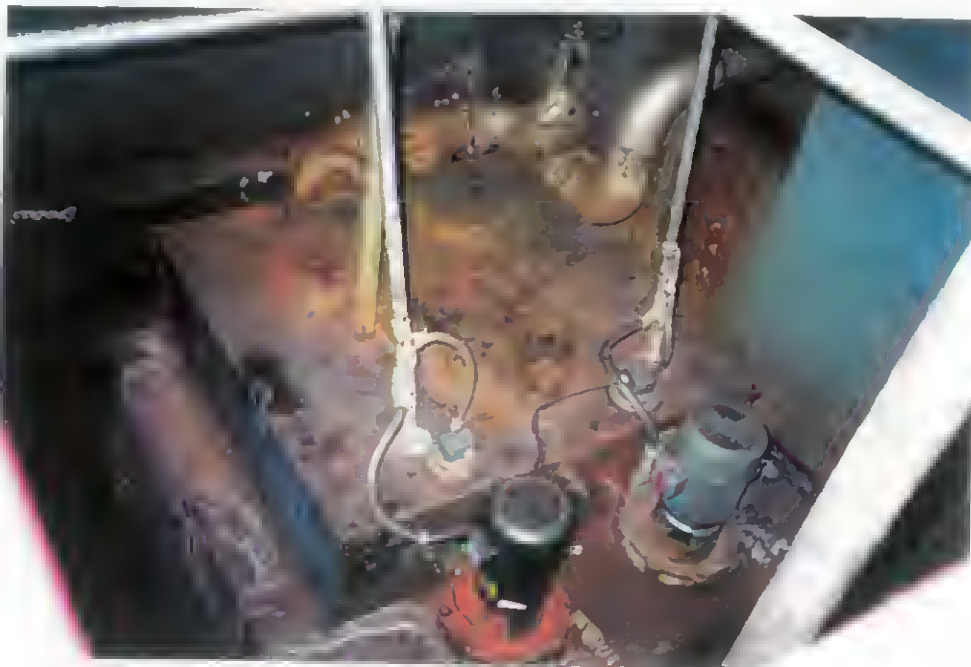
Photograph M3

**Steam pressure
reducing station**



Photograph M4

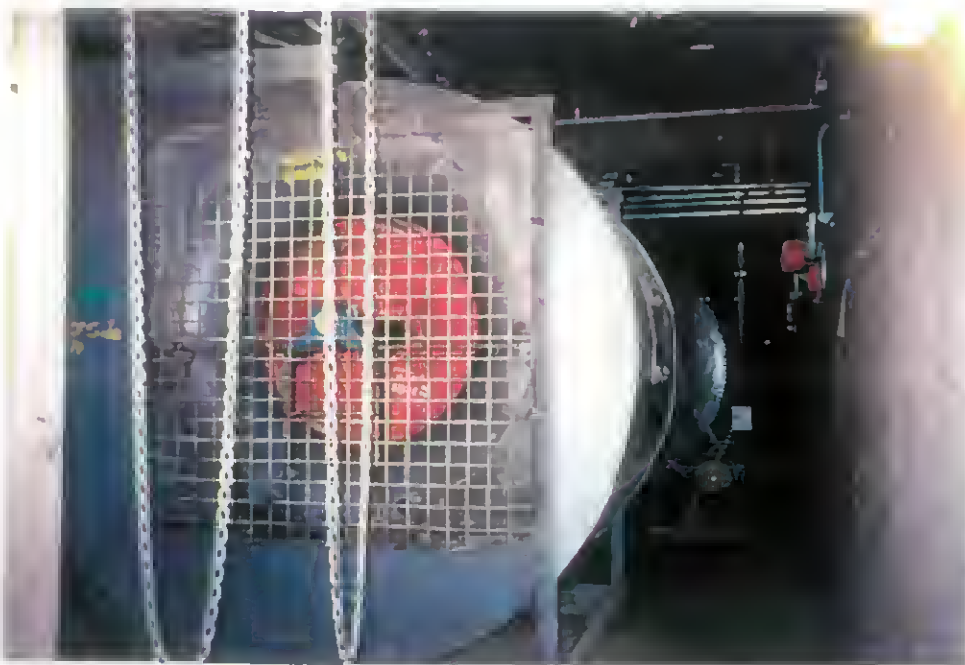
**Steam and
chilled water
heat exchangers
and secondary
heating/chilled
water pumps**



Photograph M5

**Steam
condensate
return pumps
and receiver in
the B-6 Level
mechanical room**

X



Photograph M6

**7th floor
mechanical room
air handler
return air fan**



Photograph M7

New H&V units,
with steam coils,
located in the B-6
Level mechanical
room

X



Photograph M8

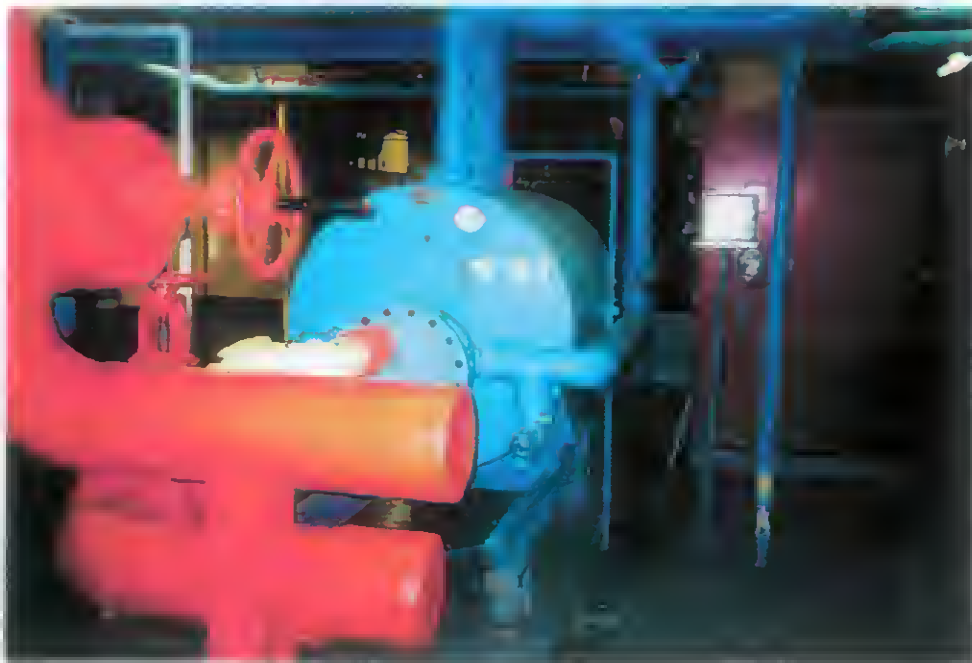
Domestic water
pressure
reducing station



Photograph M9

Domestic water
booster pump

x



Photograph M10

Domestic water
preheat tank



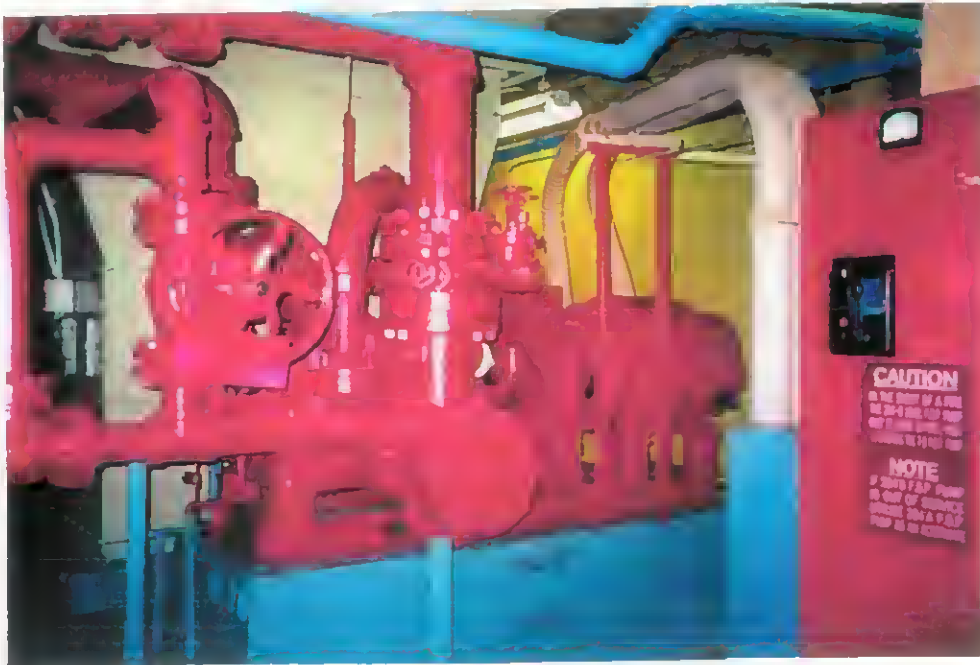
Photograph M11

**Steam and
electric domestic
water heaters
and circulating
pumps**



Photograph 12

**Large electric
water heater**



Photograph M13

Electric fire pump located in the 7th floor mechanical room



Photograph M14

Standpipe riser with a fire hose rack and fire extinguisher cabinet located in the stairs



Photograph M15

**Fire alarm
panels for the
new system being
installed**



Photograph M16

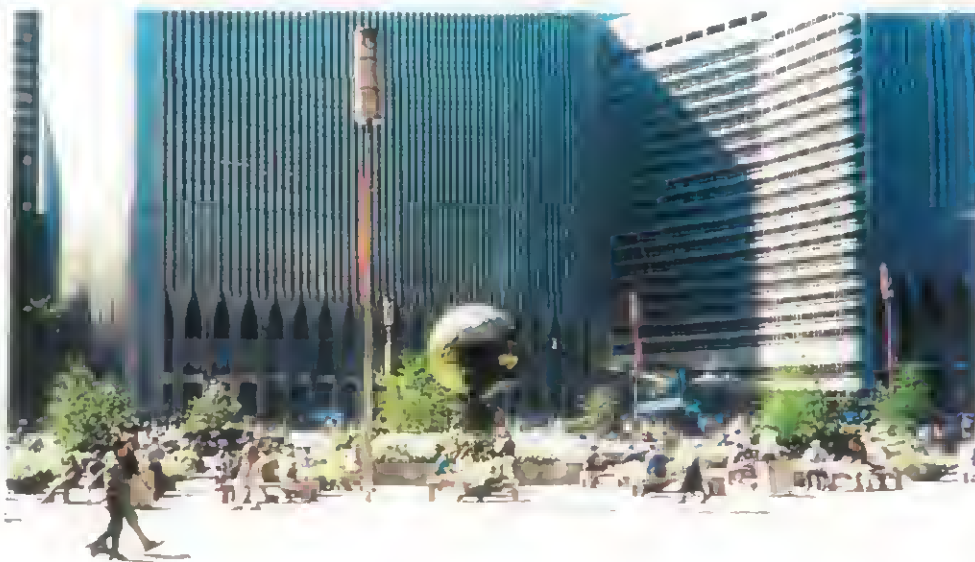
**Duct smoke
detectors for a
typical air
handler**



Photograph M17

Exit sign, manual
pull station, and
alarm

×



Photograph 1

**Austin Tobin
Plaza looking
southwest**



Photograph 2

**Sidewalk, curb,
and planter
details on
sidewalk looking
west along Vesey
Street**



Photograph 3

Sidewalk
conditions along
Vesey Street near
West Broadway



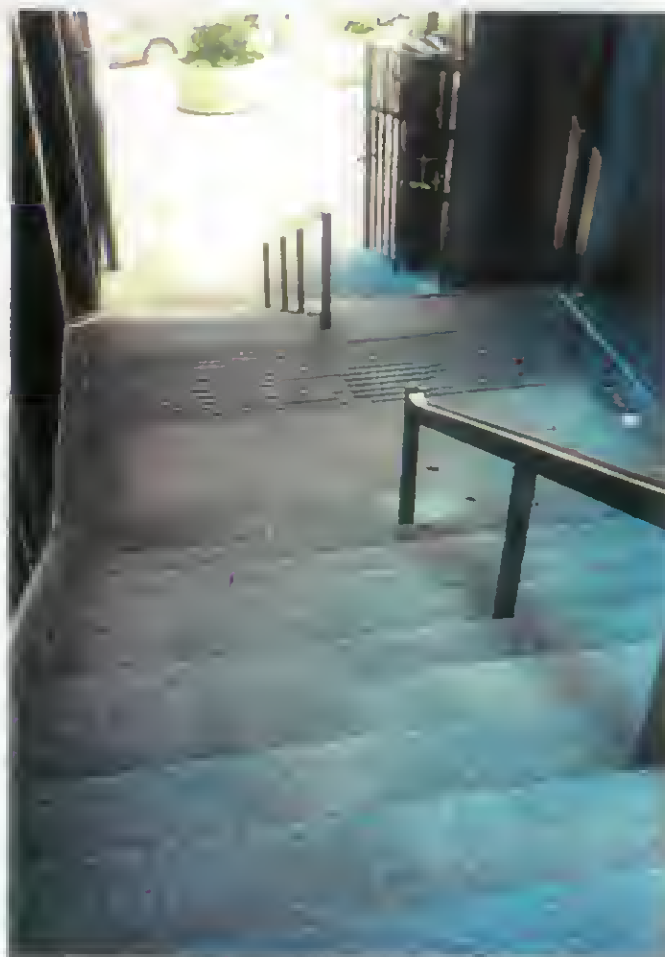
Photograph 4

Sidewalk
replacement in
progress West
Street near
Customs House



Photograph 5

**Vehicular drop
off at entrance to
1 WTC on West
Street**



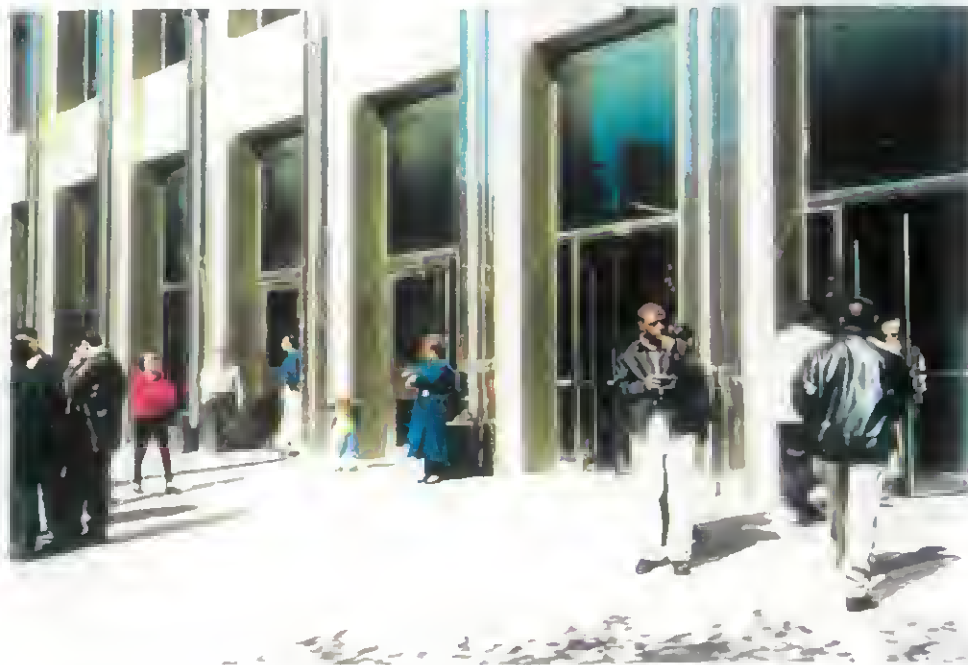
Photograph 6

**Typical granite
stairway from
Plaza between
WTC 1 and hotel**



Photograph 7

Street furniture
and pavement
south of WTC 2
along Liberty
Street



Photograph 8

New granite
pavement south
at 2 WTC
entrance



Photograph 9

Sidewalk and
steps south of 4
WTC at Liberty
and Church
Street



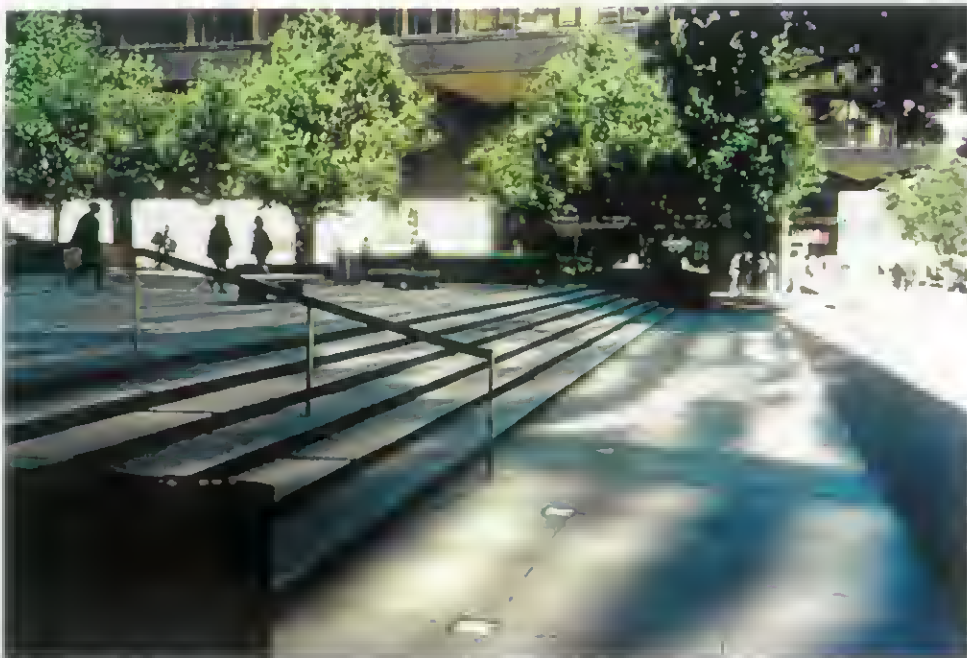
Photograph 10

Street furniture,
planters, and
tree wells along
Church Street at
4 WTC



Photograph 11

**Ramped
entrance from
Church Street
looking west into
Tobin Plaza**



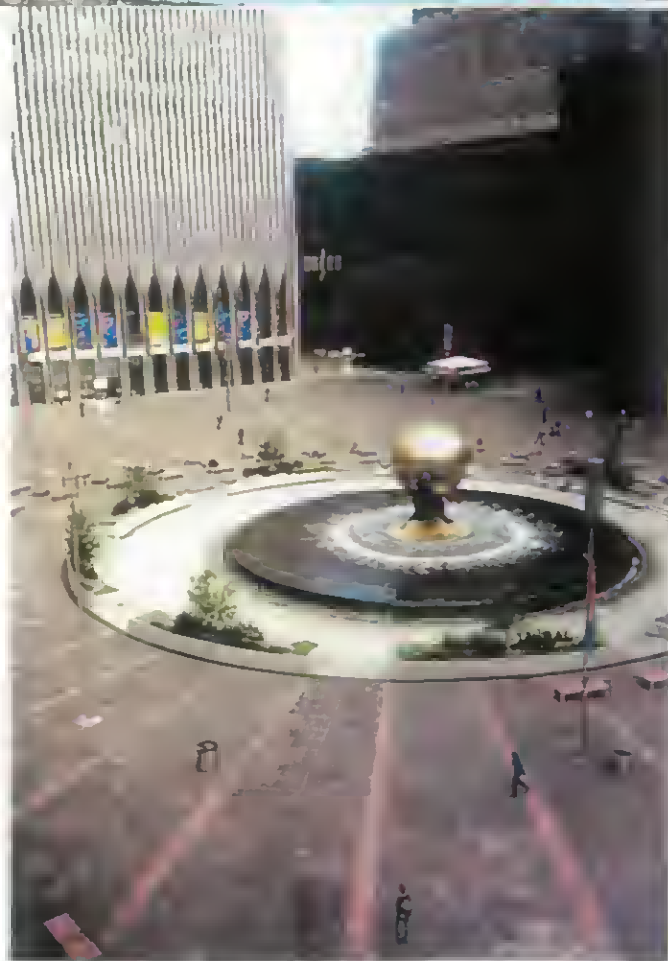
Photograph 12

**Church Street
steps entering
Plaza**



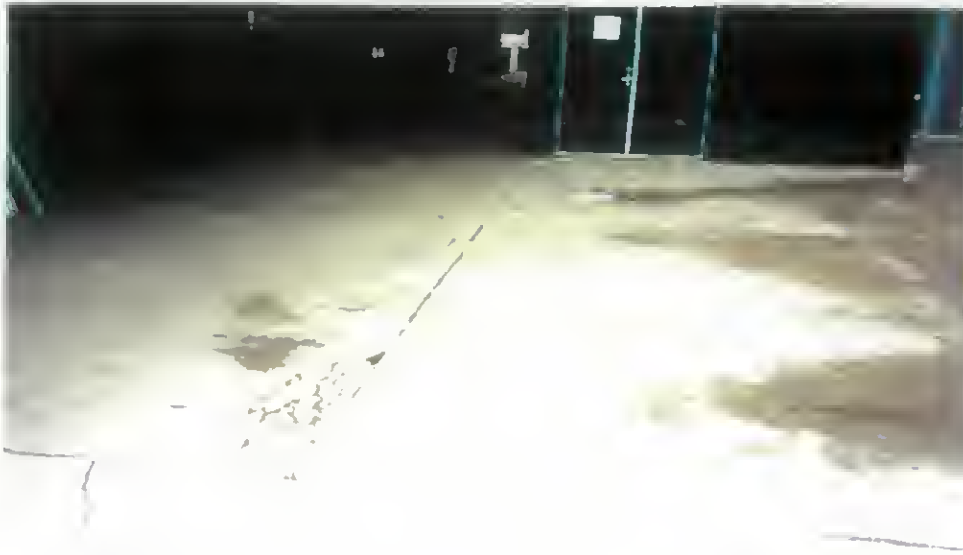
Photograph 13

**Sculpture at
entrance to Plaza
on Church Street**



Photograph 14

**Overview of
Plaza from
4WTC**



Photograph 15

**Damaged Plaza
pavement under
overhang for 4
WTC**



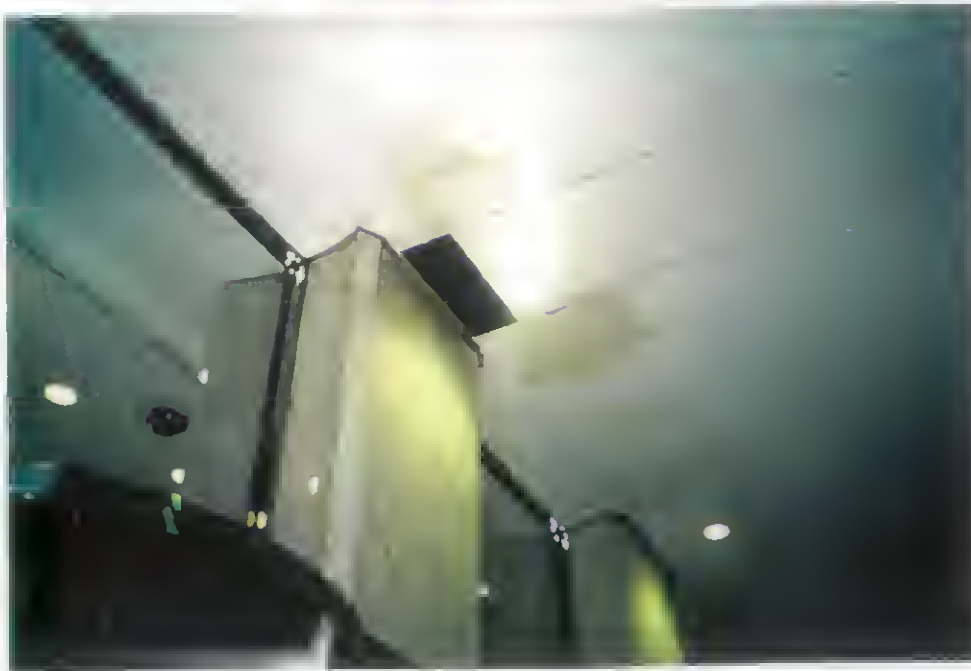
Photograph 16

**Planter damage
at Plaza level
near 4 WTC**



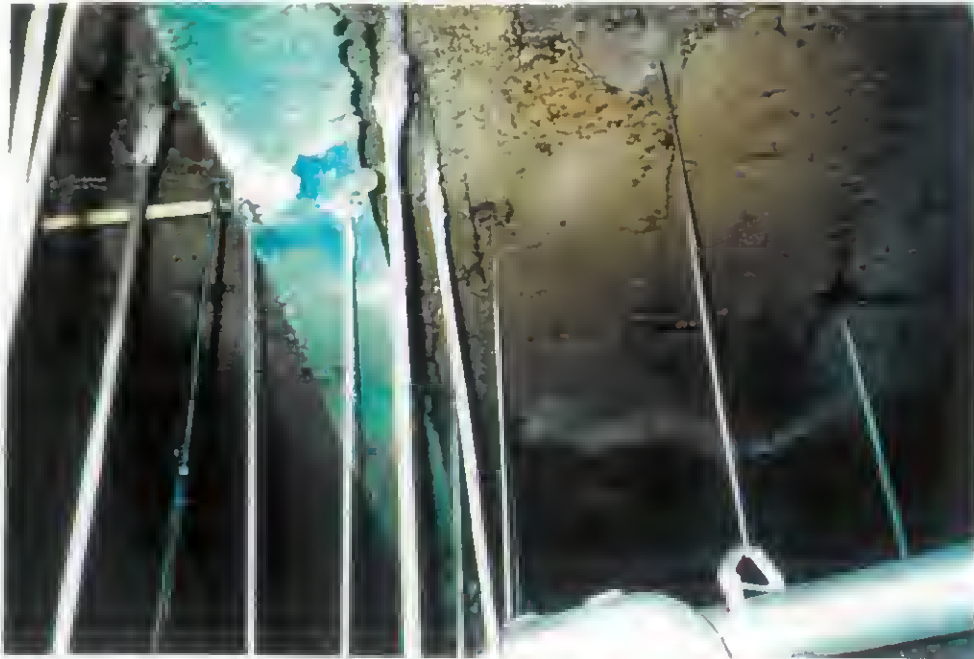
Photograph 17

Expansion joint
in Plaza deck
along east side
near Church
Street



Photograph 18

Leaks at
underside of
Plaza deck
visible near 1
WTC entrance



Photograph 19

Structure of
Concourse level
visible from 4
WTC mechanical
room on B1 level

x



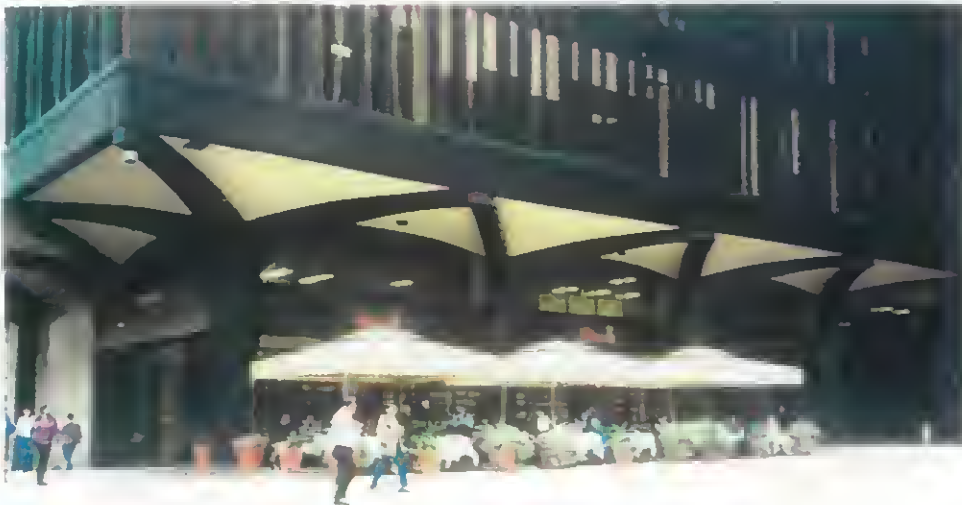
Photograph 20

Metal deck and
framing for
Plaza level
visible from
construction
area in
Concourse level



Photograph 21

**Steel framing
and metal deck
for 3rd Floor
framing visible
in vacant retail
space at 4WTC
Plaza level**



Photograph 22

**Exterior finishes
and space under
overhang being
used for
restaurant
seating**



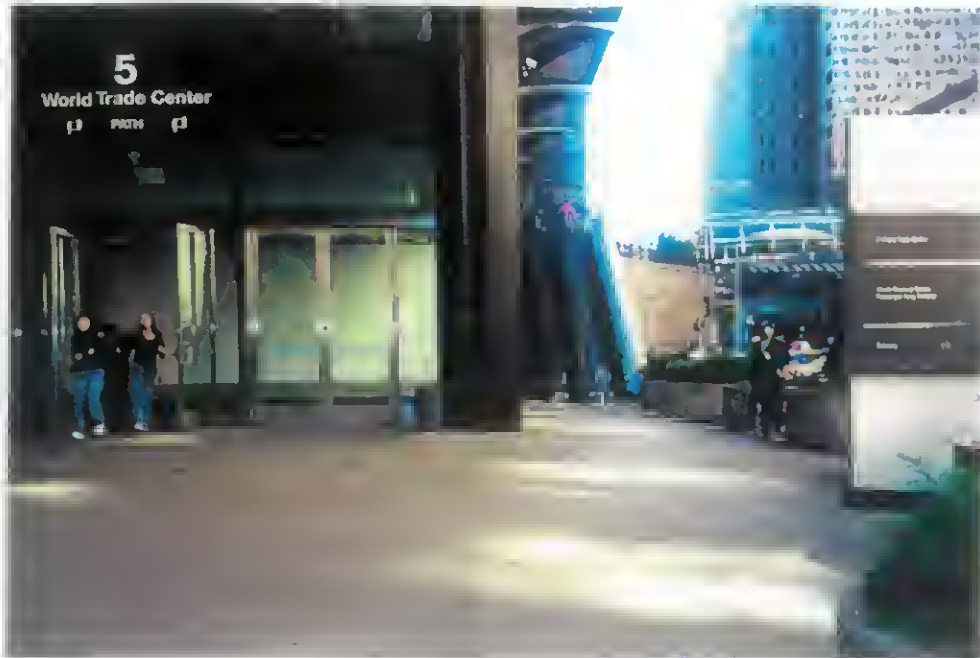
Photograph 23

**Detail of exterior
structure and
finishes at 5
WTC**



Photograph 24

**Doors to
northeast
building
entrance occur
on a level
between the
Concourse and
the Plaza**



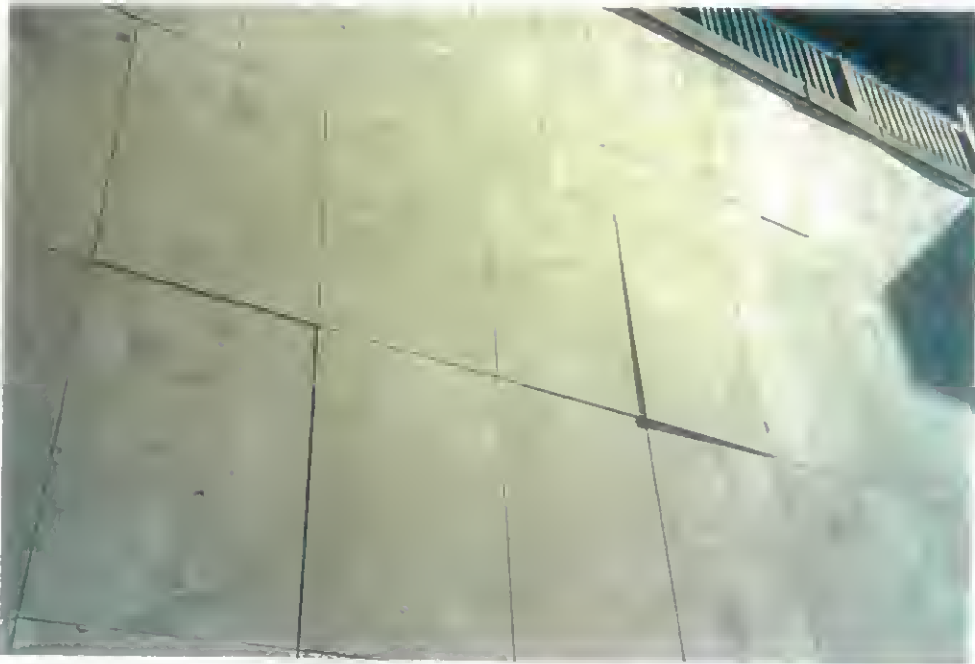
Photograph 25

Mall entrance
detail along
Vesey Street –
Note exterior
escalators to
Plaza level on the
right



Photograph 26

Retail showcase
windows at
Liberty Street
side



Photograph 27

Example of
displaced marble
panels to be
monitored for
further
movement



Photograph 28

Damaged marble
panel near
bottom of
exterior stairway
between 1 and 4
WTC



Photograph 29

Central area of
Concourse level
at head of PATH
escalators

X



Photograph 30

Old travertine
flooring in an
area scheduled to
be replaced with
terrazzo



Photograph 31

New terrazzo flooring in the north Concourse corridor looking west towards 1 WTC

X



Photograph 32

New terrazzo flooring in west corridor looking south towards 2 WTC



Photograph 33

South corridor
with original
finishes looking
east from 1 WTC



Photograph 34

Intersection of
south and east
corridors with
original finishes



Photograph 35

**Central corridor
looking north
towards PATH
entrance area**

X



Photograph 36

**Central corridor
looking south
toward Liberty
Street entrance**



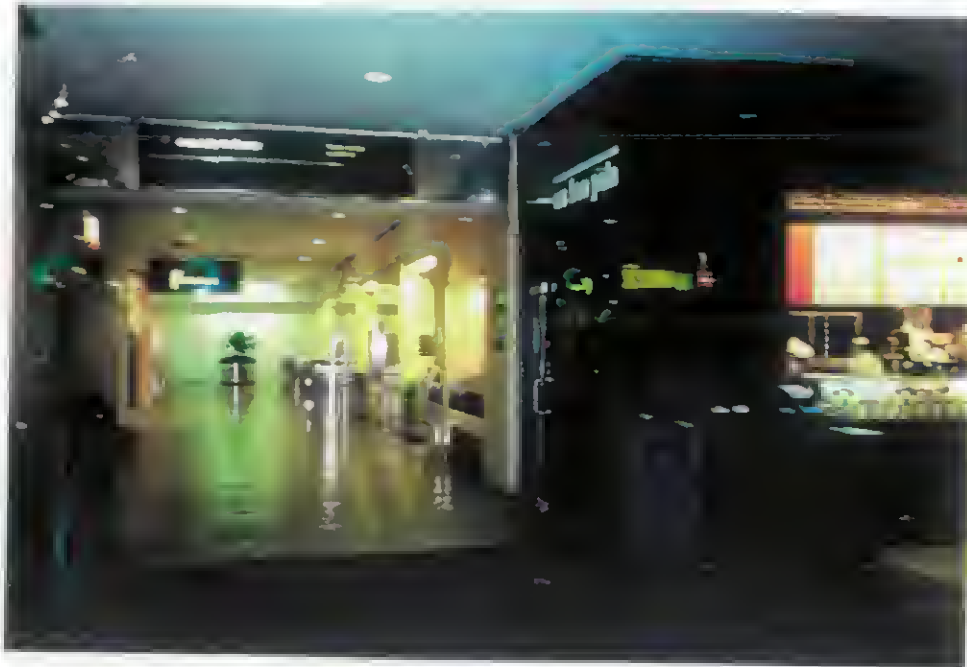
Photograph 37

**Detail of Liberty
Street entrance
doors with ADA
features on left**



Photograph 38

**Stairway and
escalators at
southeast
building
entrance**



Photograph 39

Lobby to 4 WTC
at Concourse
level is from the
retail mall area

X



Photograph 40

East corridor
looking north



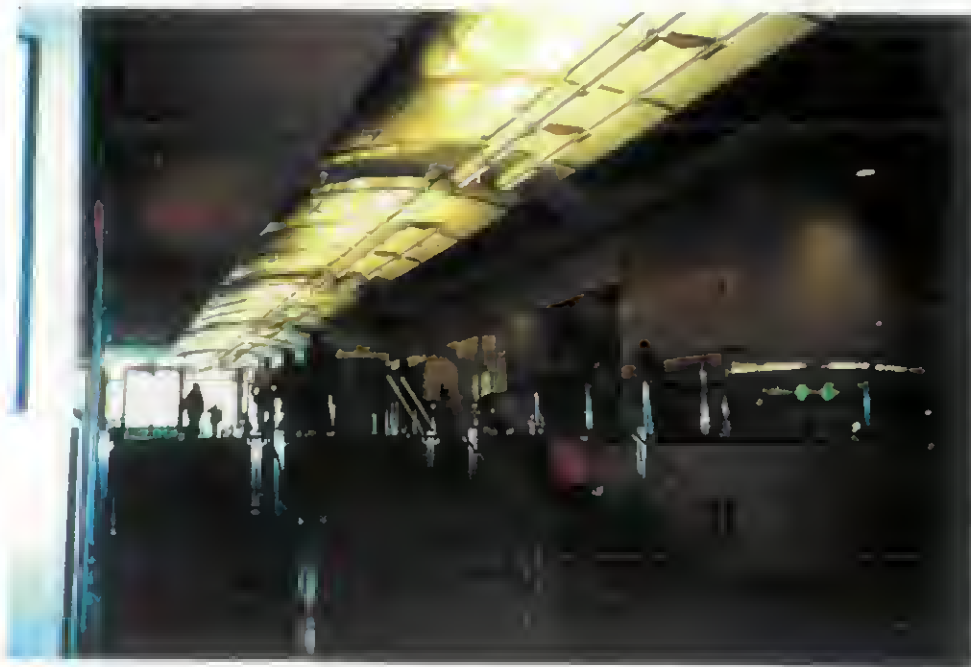
Photograph 41

Central corridor
looking west



Photograph 42

North corridor
looking east



Photograph 43

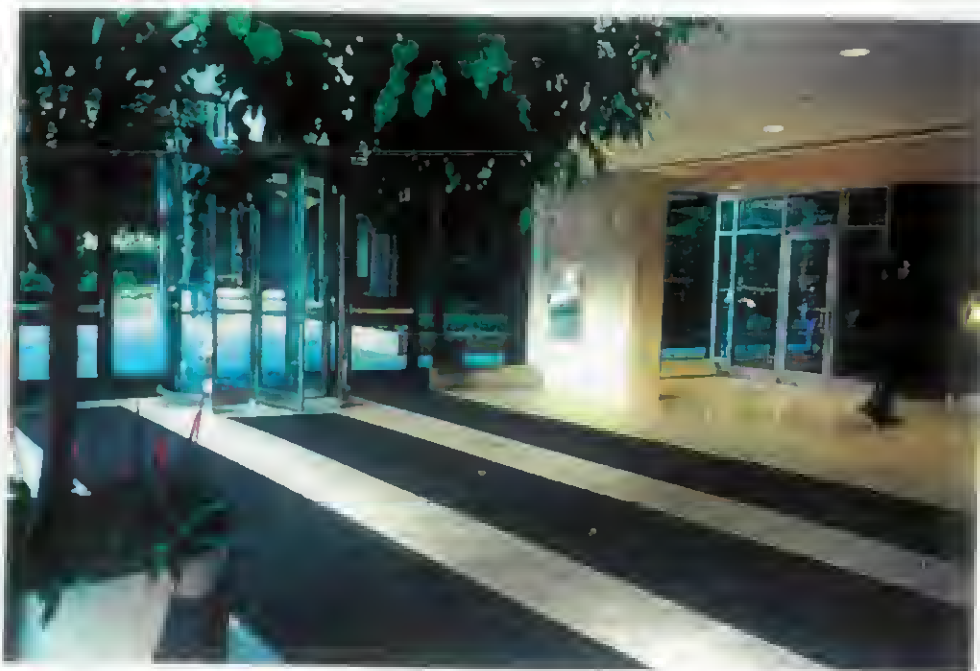
5 WTC lobby is
accessed by
stairway and
ADA ramp from
mall at
Concourse level

X



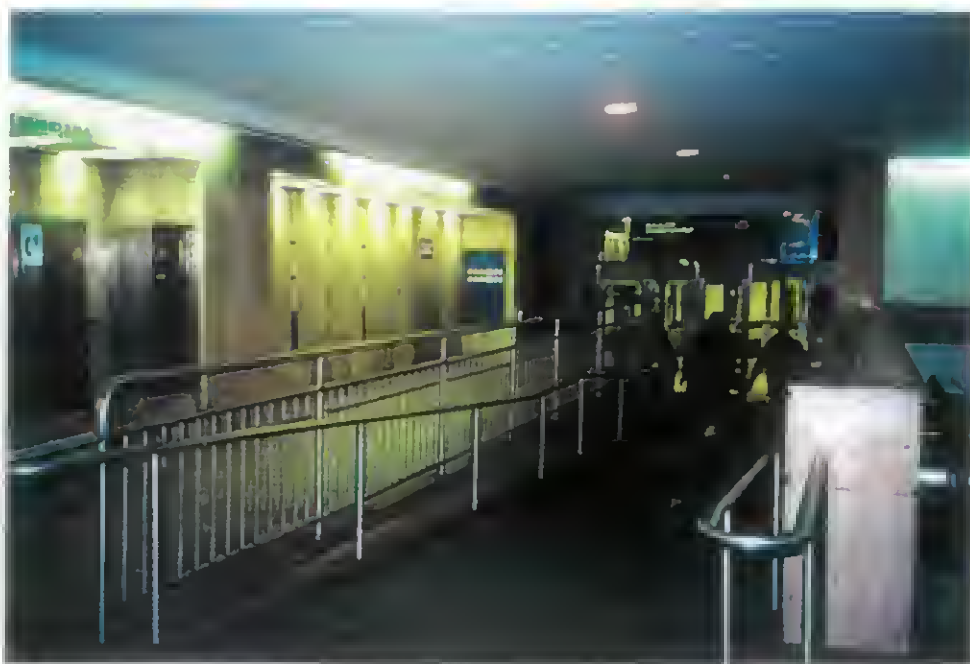
Photograph 44

Grade level
entrance at
northwest corner
of complex
occurs between
Plaza and
Concourse levels
below the 5 WTC
building



Photograph 45

Entrance from
Plaza side at 5
WTC



Photograph 46

Entrance to NYC
subway system
from eastern
corridor



Photograph 47

Vacant retail
space at Plaza
level below 4
WTC



Photograph 48

Change in level
in retail space
Plaza level below
4 WTC



Photograph 49

Rear service
corridor at
Concourse level
east side



Photograph 50

Elevator lobby at
4 WTC 3rd Floor



Photograph 1

**Entrance pylon
at Church Street
Plaza entry**



Photograph 2

**Existing
structure below
building at B-2
level remaining
from PATH
station**



Photograph 3

Typical building structure with 30' column bays, cantilever at perimeter, steel framing and metal deck



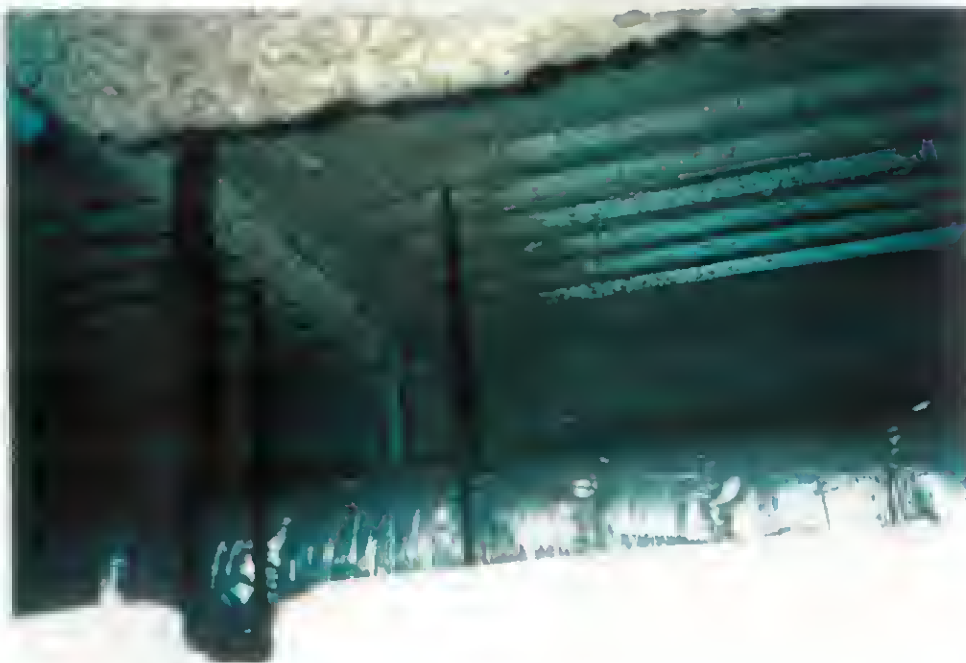
Photograph 4

Spray applied fireproofing at framing



Photograph 5

**Double girder
used on either
side of column to
frame cantilever**



Photograph 6

**Framing of
cantilever below
4th floor deck**



Photograph 7

**Aluminum
cladding conceals
steel truss to
support
cantilever at 4th
floor overhang**



Photograph 8

**East and north
elevations**



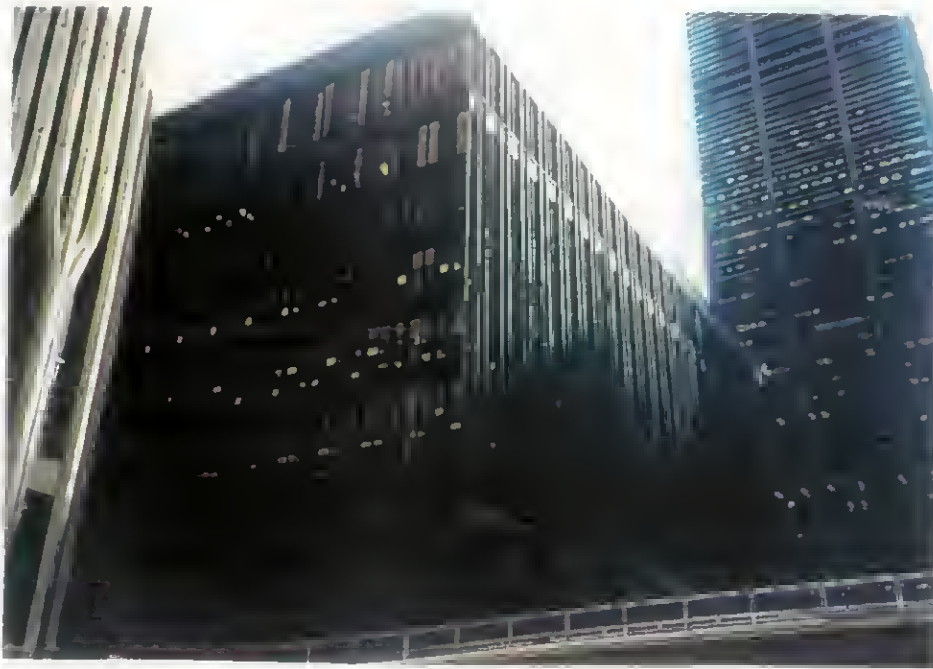
Photograph 9

North and west
elevations from
roof of 5WTC



Photograph 10

Supplementary
stair tower
added in 1995-96
to serve trading
room on 8th
floor



Photograph 11

West and south
elevations

X



Photograph 12

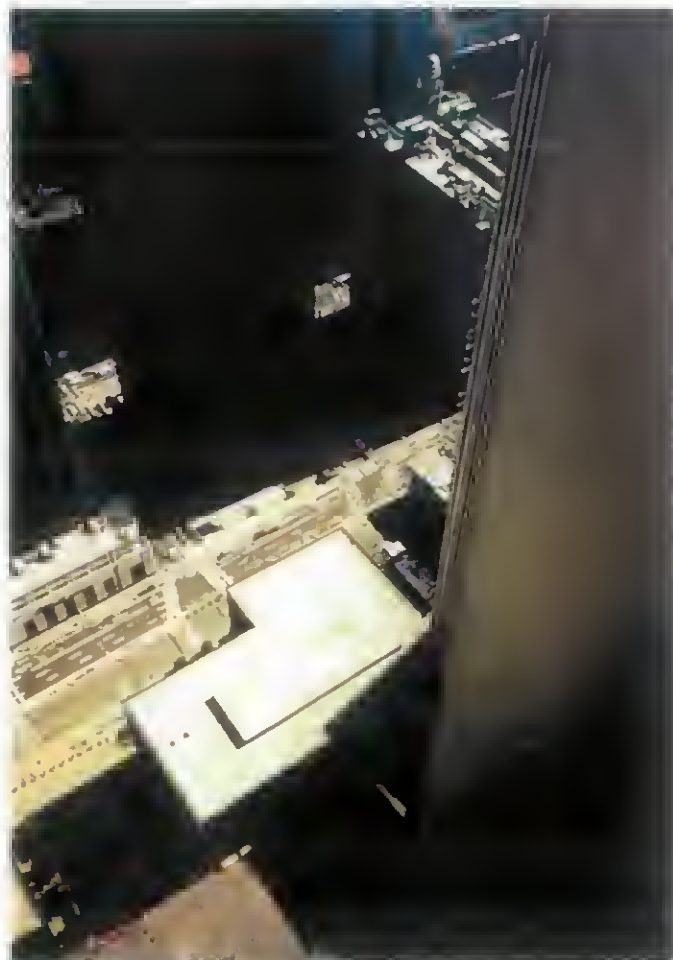
South and east
elevations



Photograph 13

Detail of sill
condition at 4th
floor where
painted finish is
failing

X



Photograph 14

Roof layout
overview from
tower



Photograph 15

Main field of roof with mechanical penthouse, window washing rig track and parapets visible



Photograph 16

Southeast stairway exiting into well at roof partially blocked by debris



Photograph 17

**Concourse level
elevator lobby**



Photograph 18

**Main entrance at
Plaza level from
Church Street.
Escalator at
right connects to
Concourse level**



Photograph 19

**Plaza level
elevator lobby**



Photograph 20

**Typical office
floor elevator
lobby**



Photograph 21

**Office floor
corridor finishes**

X



Photograph 22

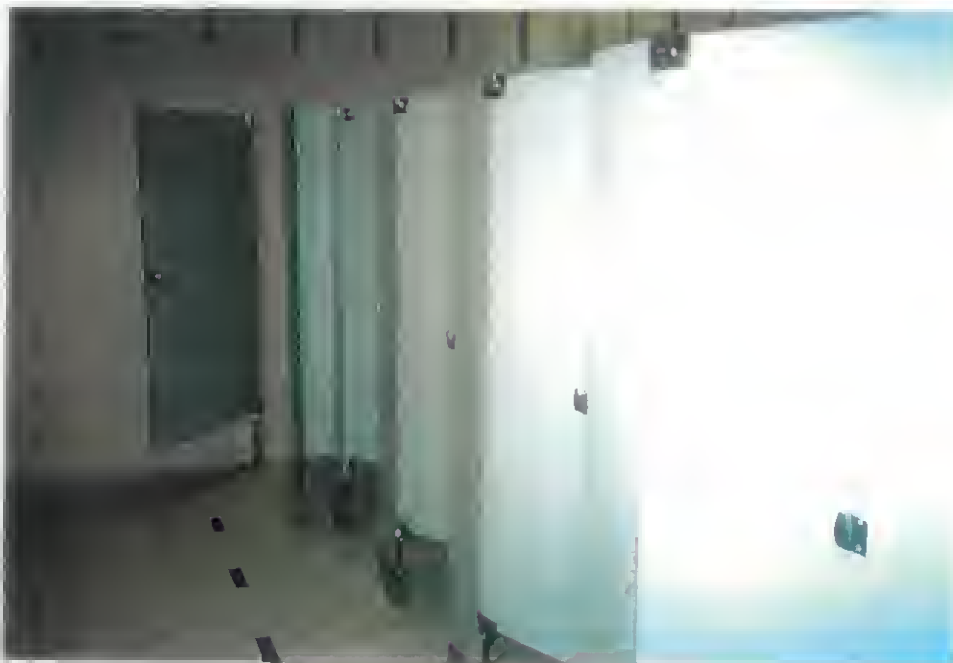
**Office space
along window
wall**



Photograph 23

**Representative
office space**

X



Photograph 24

**Typical rest
room finishes**



Photograph 25

Typical rest
room finishes



Photograph 26

Stairway finishes



Photograph 27

**Mechanical
equipment room
finishes on 9th
floor**

X



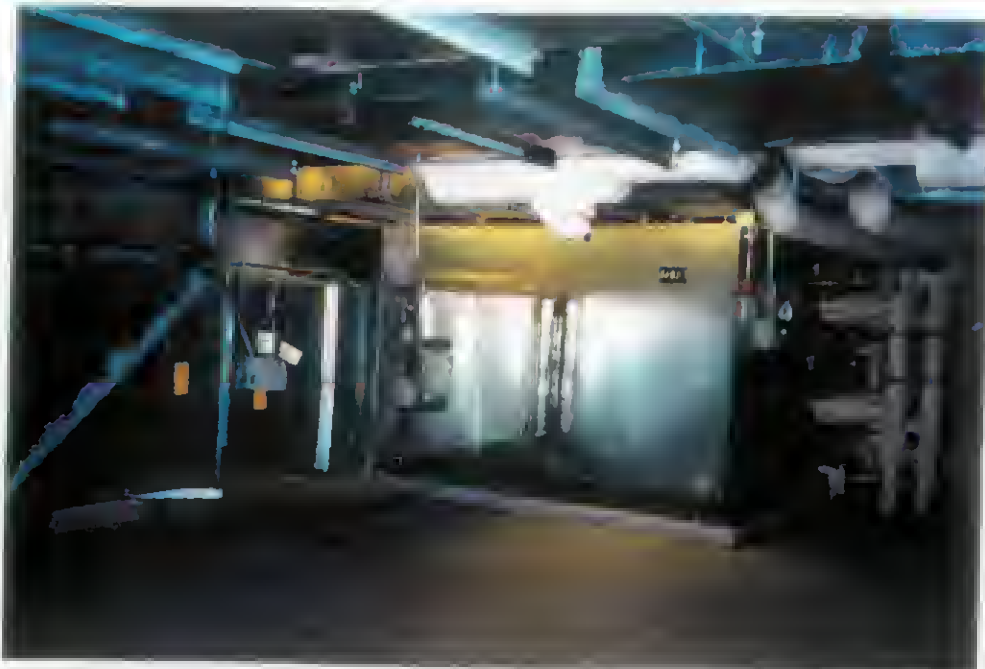
Photograph 28

**Mechanical
equipment room
finishes on 9th
floor**



Photograph M1

Typical perimeter
induction unit with
a chilled/hot water
coil



Photograph M2

Air handling unit
located in the
3rd floor
mechanical room



Photograph M3

**Chilled water
pumps located in
the B1
mechanical room**



Photograph M4

**Plate and frame
heat exchangers
for chilled water
located in the B1
mechanical room**



Photograph M5

Condenser water
supply and
return lines for
tenant
supplementary
air conditioning



Photograph M6

Heat exchanger
and circulating
pump for heating
hot water



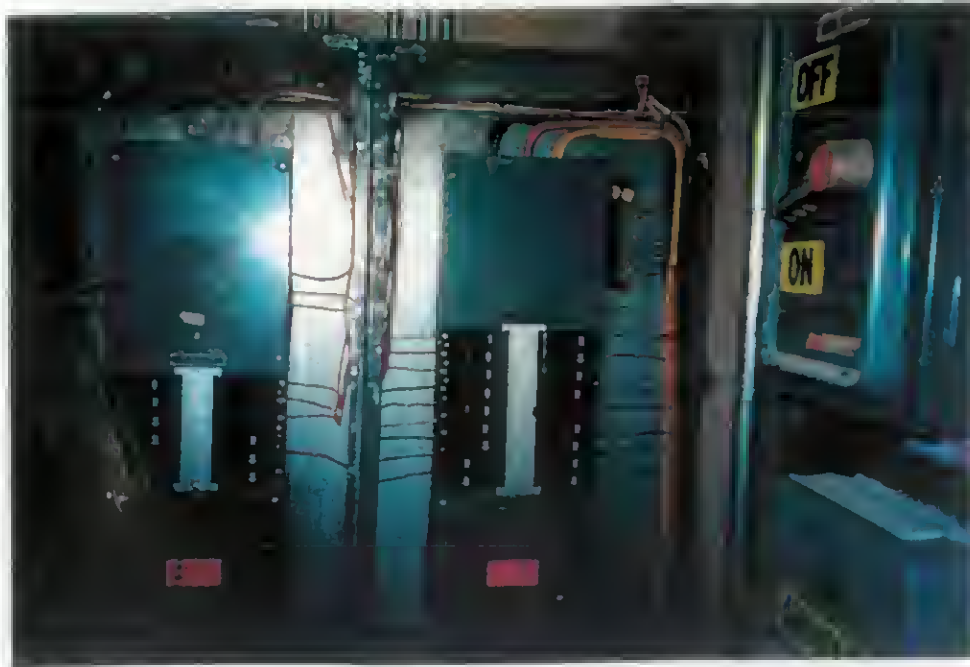
Photograph M7

**Ejectors and
tanks located in
the B1
mechanical room**



Photograph M8

**Steam domestic
water heaters
with circulating
pumps**



Photograph M9

Electric circuit
breaker panels in
a typical electric
closet

X



Photograph M10

Typical elevator
lobby without a
wall plaque
showing the
location of exit
stairs to be used
in the event of a
fire



Photograph M11

**Booster fire
pump located in
the 9th floor
mechanical room**

x



Photograph M12

**Variable
frequency drive
controllers for
the air handler
supply fans in
the 3rd floor
mechanical room**



Photograph 1

**Entrance pylon
at Church Street
Plaza entry**



Photograph 2

**Existing
structure at 8th
floor below the
MER. Spray-
applied
fireproofing and
rigid panel sound
insulation are
visible**



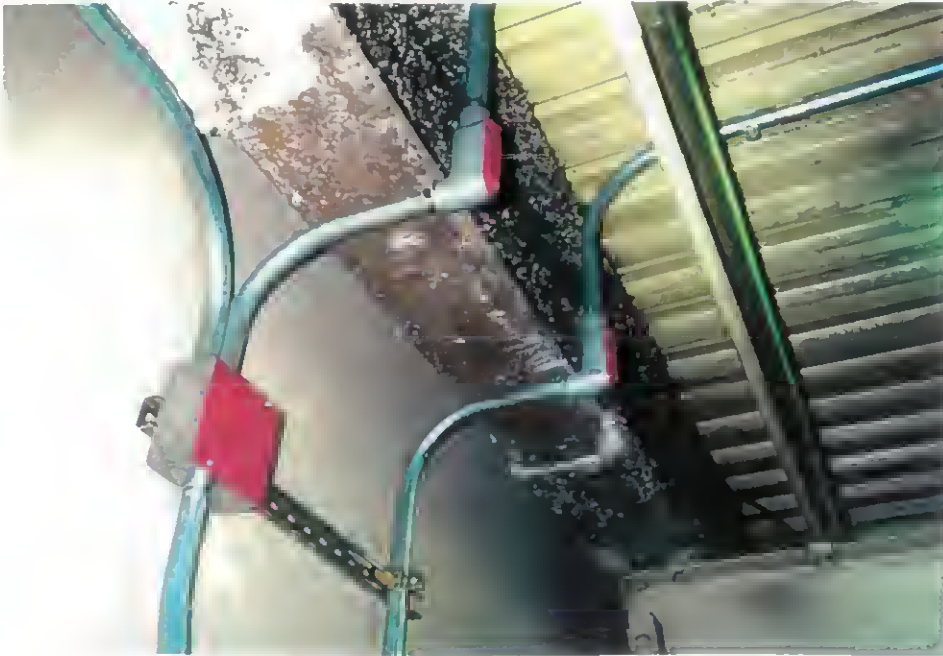
Photograph 3

Roof deck
structure with
lally-column
supports of
exterior wall
visible at 9th
Floor MER



Photograph 4

Roof deck visible
at 9th Floor
MER Customs
House



Photograph 5

Example of spray
applied
fireproofing
removed at
framing for
attachment of
equipment



Photograph 6

Structure of B1
Level at loading
docks which also
services 4WTC



Photograph 7

East elevation



Photograph 8

**Northeast corner
from Church
and Vesey
Streets**



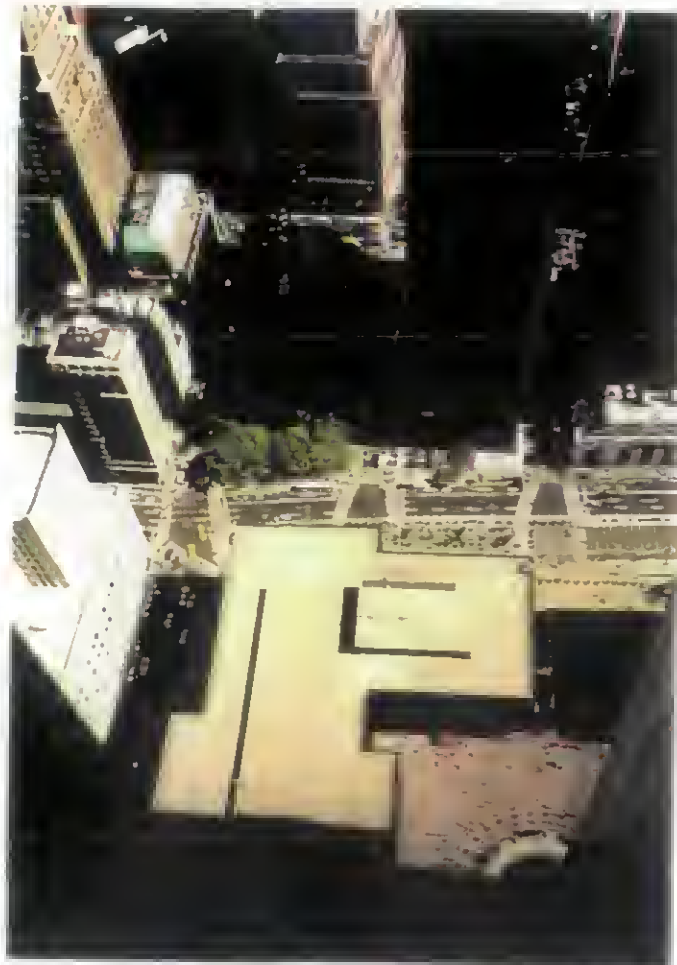
Photograph 9

North elevation



Photograph 10

South and west
elevations from
roof of 4WTC



Photograph 11

**Roof layout
overview from
tower**

X



Photograph 12

**Main field of
roof with
mechanical
penthouse,
window washing
rig track and
parapets visible**



Photograph 13

Detail of roof
drain with
vegetation
growth
supported by the
moisture held in
paver backing



Photograph 14

Detail of
perimeter
flashing detail
with vegetation
growth



Photograph 15

**Penthouse roof
with pavers
removed for
patching of
membrane**

X



Photograph 16

**Severely rusted
underside of roof
deck from
previous roof
leaks**



Photograph 17

Concourse level
stair and ramp
entrance from
retail mall

X



Photograph 18

Concourse level
entrance



Photograph 19

Plaza level lobby



Photograph 20

**Office floor
corridor finishes**



Photograph 21

Office space
along window
wall



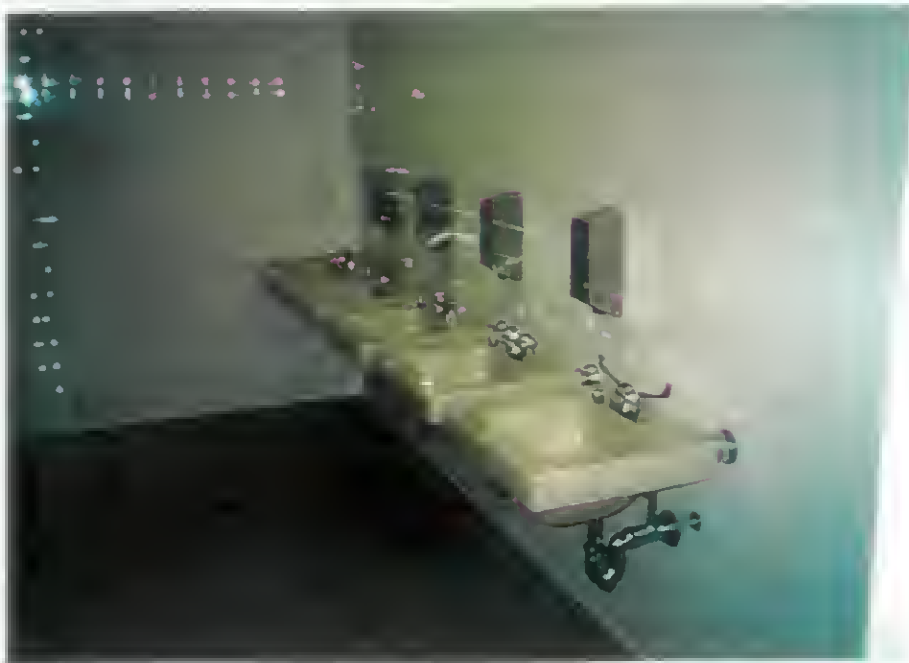
Photograph 22

Representative
office space



Photograph 23

**Typical rest
room finishes**



Photograph 24

**Typical rest
room finishes**



Photograph 25

Stairway finishes



Photograph 26

**Mechanical
equipment room
finishes on 9th
floor**



Photograph 27

**Freight elevator
lobby finishes on
9th floor**



Photograph 28

**Stored debris
blocking
corridor on B1
level**



Photograph M1

Typical air
handling unit
located in the
9th floor
mechanical
room

X



Photograph M2

Chilled water
supply line from
the central plant



Photograph M3

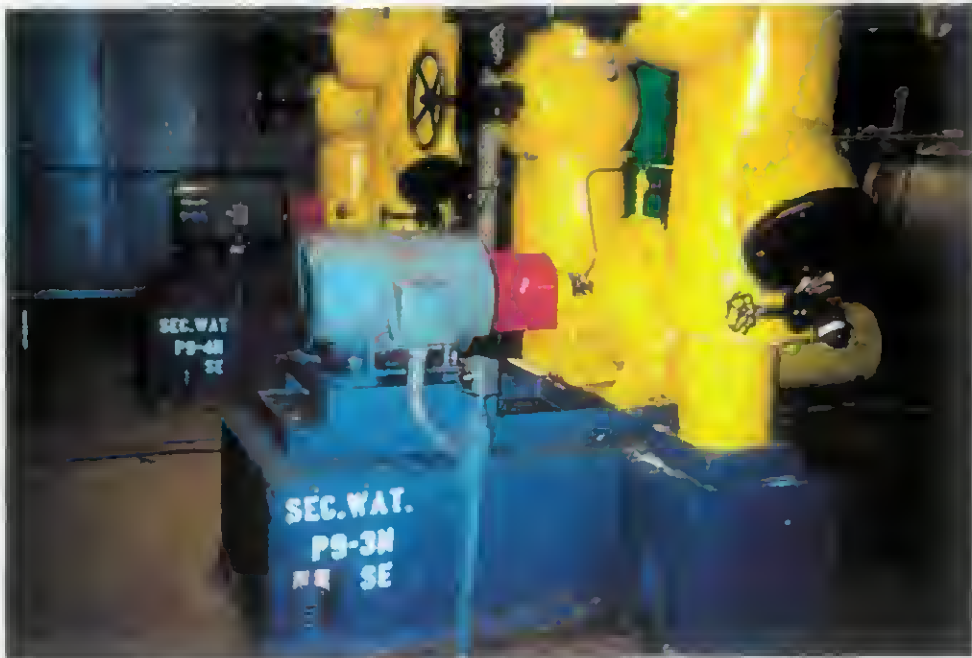
Typical return
air fan located in
the 9th floor
mechanical room

X



Photograph M4

Steam pressure
reducing station



Photograph M5

Secondary
chilled/heating
hot water pumps
located in the 9th
floor mechanical
room

X



Photograph M6

Heat exchangers
and circulating
pumps for
heating hot
water system



Photograph M7

**Steam
condensate
pumps and
receiver**



Photograph M8

**Domestic water
supply pumps**



Photograph M9

Ejector pumps
and tank

X



Photograph M10

Steam domestic
water heaters
and circulating
pumps



Photograph M11

**Standpipe riser
with sprinkler
supply, and flow
and tamper
switches**



Photograph M12

**Typical office
floor corridor
with exit sign,
manual pull
station,
audio/visual
alarm, and fire
warden station**



Photograph 1

River water pumps
in the remote
pumping station



Photograph 2

Traveling screen
filter for the
river water
system



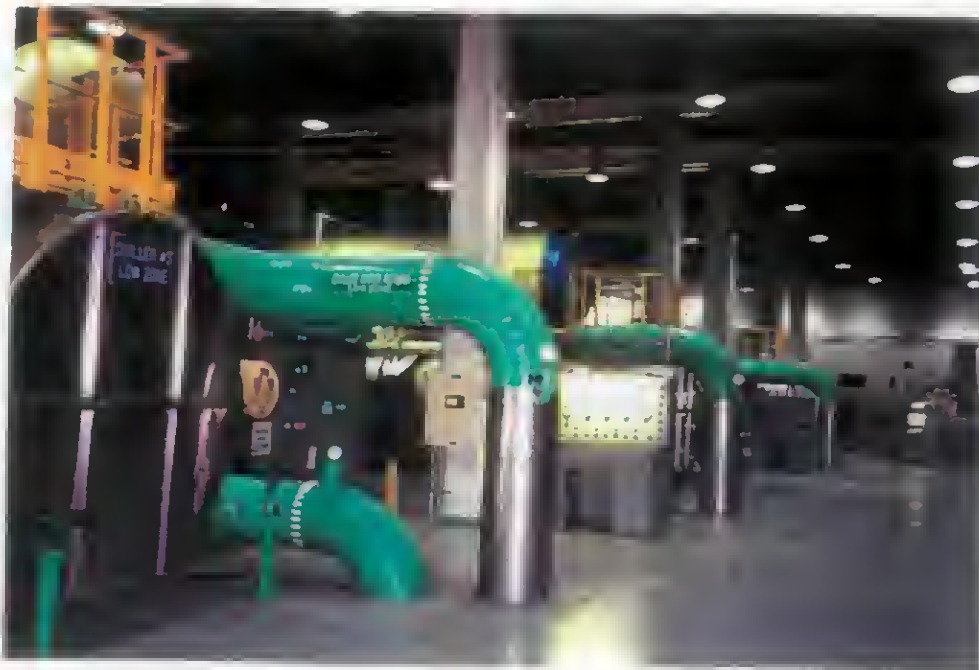
Photograph 3

River water
piping within the
complex



Photograph 4

River water
strainers for the
closed loop
condenser water
systems



Photograph 5

Main chiller #3



Photograph 6

Main chiller # 7
(split for high
and low zone)



Photograph 7

Chilled water
pumps

X



Photograph 8

High and low
zone chilled
water piping



Photograph 9

Supplemental
chillers

X



Photograph 10

Refrigerant
storage tanks



Photograph 11

Heat exchanger
for economizer
operation

x



Photograph 12

Pneumatic
control air
compressors



Photograph 13

Steam pipe rack



Photograph 14

Steam service
valve (planned
for replacement)



Photograph 15

Steam
distribution
plant



Photograph 16

One of the main
water service
meters



Photograph 17

Switchgear
within the
Primary
Distribution
Center



Photograph 18

Recently
upgraded high
voltage feeders



Photograph 19

Upgraded
electrical
substation



Photograph 20

Electrical
distribution bus
ducts (new and
old) from a
substation

Subgrade (Parking & Storage Areas)

World Trade Center
New York, New York



Photograph 1

Slurry wall exposed
in Level B5



Photograph 2

Base of slurry wall -
Level B6



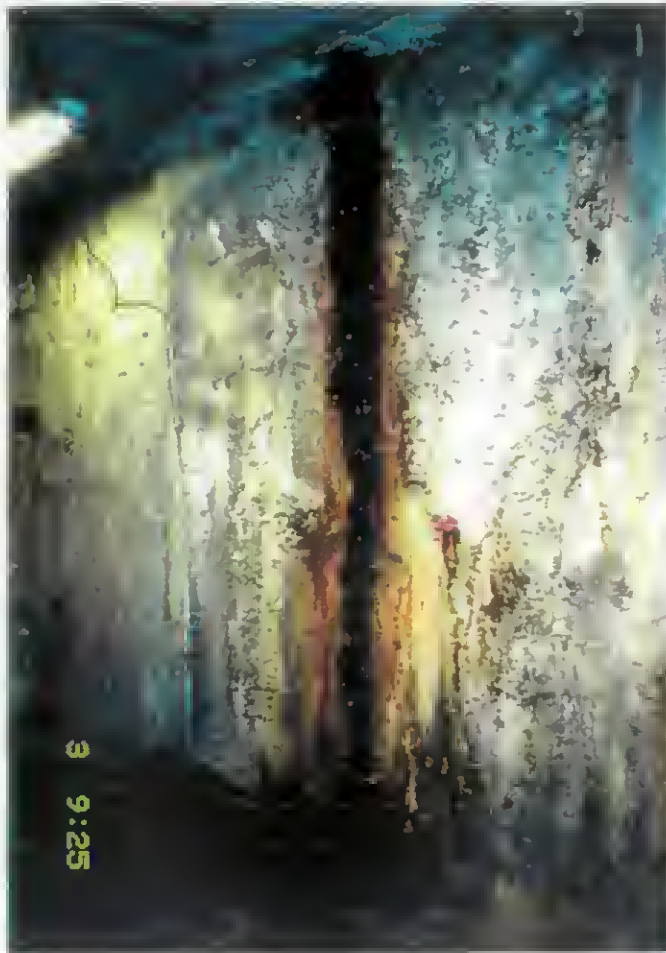
Photograph 3

Ceiling slab spalling at
slurry wall

Photograph 4

Ventilation
plenum typical -
runs along north,
east, and south
walls of garages
at Levels B2 - B4





Photograph 5

Leakage stains on
slurry walls

Photograph 6

Stains on slurry
wall and patches
for leaks





Photograph 7

Spalling garage
slab - Level 2, North



Photograph 8

Spalling slab in B5
Central Plant

Subgrade (Parking & Storage Areas)

World Trade Center
New York, New York



Photograph 9

New slab being
installed in loading
dock area - start of
multi-stage program

X



Photograph 10

Loading dock area

Subgrade (Parking & Storage Areas)

World Trade Center
New York, New York



Photograph 11

Loading dock area
for US Customs
Buildings



Photograph 12

Missing fireproofing
at loading dock



Photograph 13

Missing fireproofing
at ventilation
plenum - B2 North



Photograph 14

Missing fireproofing
at B-2 Garage



Photograph 15

Leased offices at
former parking area
(B1) for Marriott
Hotel

X



Photograph 16

Repairs of ceiling
slab at B2 ceiling
due to bomb
explosion



Photograph 17

Repairs at column
brackets to support
weakened slabs



Photograph 18

New ceiling slab
installed above
refrigeration plant
due to bomb blast

Subgrade (Parking & Storage Areas)

World Trade Center
New York, New York



Photograph 19

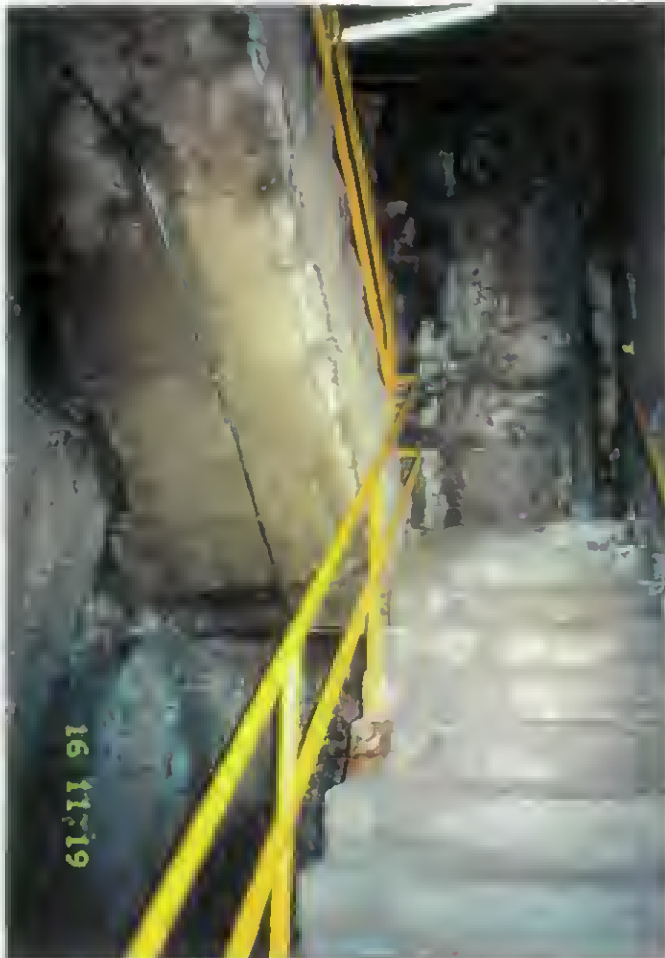
Ceiling under B4
ramp (south) in
ventilation plenum
requires repairs

X



Photograph 20

Level B2 slab
spalling (at ramp)



Photograph 21

Stair in projection
serves as PATH
emergency exit



Photograph 22

Typical subgrade
stair requires
cleaning and
some require
painting



Photograph 23

**B5 and B6 storage
spaces**



Photograph 24

**B4 northeast stair
door being replaced**



Photograph M1

Heating and
ventilating unit in the
loading dock area



Photograph M2

Window style air
conditioning unit
used in the parking
office



Photograph M7

**Tenant air-cooled
condensers in the
northwest projection
area**

X



Photograph M8

**Tenant emergency
generator in the
northwest projection
area**



Photograph M9

Typical sewage
ejector pit



Photograph M10

Pumps within an
ejector pit

Subgrade (Parking & Storage Areas)

World Trade Center
New York, New York



Photograph M11

House traps within
subgrade space

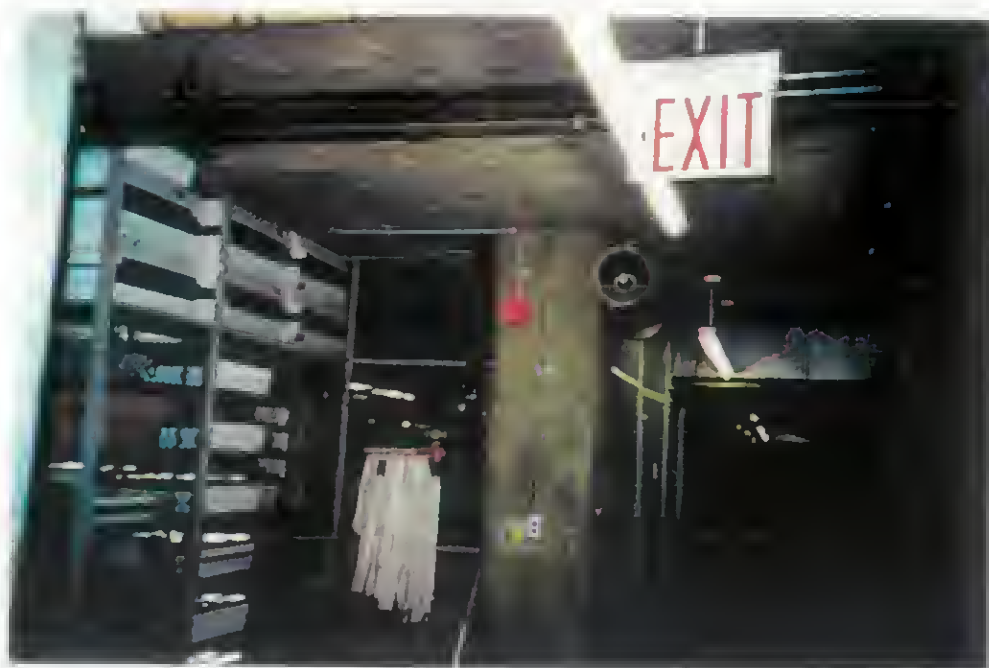


Photograph M12

High voltage
electrical duct banks
painted purple
within the subgrade
space

Subgrade (Parking & Storage Areas)

World Trade Center
New York, New York



Photograph M13

Life safety devices
within a subgrade
storage area

X



Photograph M14

Sprinkler head in
the loading dock
area observed to be
painted